MARINE REVIEW

WEEKLY.] AND MARINE RECORD. [ESTABLISHED, 1878.

Vol. XXVII | Eastern Office, 1023 Maritime Bldg., New York City. Chicago Office, 373 Dearborn St. | CLEVELAND, O., APRIL 2, 1903. Published every Thursday at 39-41 Wade Bldg. by the Marine Review Pub. Co. [Entered at Cleveland Post Office as second-class matter.] | Subscription $3.00 year. Foreign $4.50 year. Single Copy 10 cents. | No. 14

SUBMARINE IS ONLY A TOY.

Considering the articles which fairly inundate the newspapers and magazines regarding the submarine boats one would think that this type had achieved success, but really the submarine is not worth the space that has been given to it. It would be difficult indeed to outline any points upon which the submarine has been a success, except, perhaps, the single point that it has successfully remained stationary on the bottom of a body of water for a few hours. But even this is a doubtful honor, for the crew suffered great physical and mental fatigue, and it is a foregone conclusion that they were not in a warlike mood at any time during the experiment. It isn't the things that are on the outside of the submarine that need to be worried about it; it is those which are on the inside. The submarine is without practical maneuvering power and all the experiments which have been held so far justify this statement. To flounder about is not to maneuver. It has no defensive qualities whatever in itself and its offensive qualities are largely imaginary. The submarines building in the United States are propelled on the surface by a four-cylinder gasoline engine of 160 H. P. They are propelled under the water by storage batteries, indicating 70 H. P. In the recent trials of the Adder and Moccasin in Peconic bay the storage batteries ran down in three hours and the total radius of action did not exceed 21 knots. Of what earthly use could any such instrument be against a ship in motion? Moreover when the submarine is being steered with her conning tower out of water she must have a perfectly smooth sea to have any sense of direction. In the trough of the sea she cannot see anything at all except the waves rolling over her, and on the crest the spray blinds the vision of the lens. It is admitted that crews cannot live in them excepts for periods of a few hours without breaking down both physically and mentally. Living in them is intolerable, for they cannot be heated nor can any cooking be done in them. Testimony is yet to be adduced that the submarine is anything but a naval toy.

BURGER'S SUB-SURFACE BOAT.

In the last naval appropriation bill the sum of $500,000 was appropriated for the purpose of buying or building sub-surface and submarine boats, as might best seem adapted to the uses of the navy department. The sub-surface boat is the invention of Mr. Clarence L. Burger of New York and is altogether different from the ordinary type of submarine. The plan of the sub-surface boat is really very simple. It consists simply of a cigar-shaped, steel, under-water hull, holding the machinery, torpedoes, torpedo tube and other vitals safe from gun-fire, suspended by a hollow finlike structure, from a distinct steel surface hull fitted with cellulose, acting as a mere float to give vision, ventilation, buoyancy and seaworthiness, like an ordinary boat. By the separation of the two hulls, not only are the lower hull and vitals placed well out of reach of shells, but the displacement is halved so that the necessary speed can be obtained, and the upper hull made low and almost invisible at a distance. A heavily-armored conning tower rises from the lower hull through the hollow fin, slightly above the surface hull. This armored conning tower, in which the navigator stands and steers the boat, is proof against all small guns and is too small a target, in motion, for large guns to hit. Air is continually supplied to the lower hull through the armored conning tower by means of an ordinary blower, so that the ventilation is ample and gas engines are enabled to be used, by which the requisite power is obtained to drive the vessel at 16 knots. The low upper hull and fin being divided into compartments which are, in war time, completely filled with water-excluding cellulose, retain their buoyancy however perforated with shot, and as only a small part of the upper hull suffices to sustain the lower hull a considerable portion of the upper hull could be shot away without disabling the boat. The dimensions of the vessel are: Length over all, 105 ft. 6 in.; length of submerged hull, 94 ft. 3 in.; beam of surface hull, 9 ft. 7 in.; beam of submerged hull, 7 ft. 4 in.; beam of middle hull, 2 ft. 6 in.; draught, loaded, 12 ft. 10½ in.; displacement, loaded, 101 tons; armor on conning tower, 4½ in. thick; six gas engines, total horse power, 1,050; two shafts, two screws on each shaft; one torpedo boat; fixed telescope; four long Whitehead torpedoes; radius of action at 8 knots, 1,000 miles; radius of action at 16 knots, 200 miles; complement, one officer and ten men.

At Neafie & Levy's ship yard, Philadelphia, the ferryboat Ocean City for the Philadelphia & Reading Railway is nearly ready for launching. She is 169 ft. over all, 55 ft. 6 in. over guards, and when finished will be one of the finest ferry boats in the United States. The ship yard is figuring upon new contracts.

UNITED STATES NAVAL STRENGTH.

According to an official memorandum, given to Mr. Charles H. Darling, acting secretary of the navy, by Capt. Charles D. Sigsbee, chief intelligence officer, the United States is the third naval power, basing the calculations on the number of line-of-battle ships built, building and authorized, while on the basis of a comparison of vessels under construction or authorized only, the United States is second in naval strength. All authorities recognize that the real criterion of a nation's naval strength is the number of its fighting ships. Nowadays these include only armorclads capable of taking a place in the line of battle, lightly armored cruisers, protected and unprotected cruisers, gun boats, torpedo boat destroyers and torpedo boats being regarded as auxiliaries and not actual fighting craft.

"In arranging naval powers in their order of relative strength," says Capt. Sigsbee, "only these vessels should be considered which are capable of giving and receiving blows on the battle line. These are battleships, armored coast defense vessels and armored cruisers. Other vessels are necessary for various duties but the crucial test is the battle line. On this basis the relative strength is as follows:

BUILT AND AUTHORIZED.

Nation.	Total number.	Total tonnage.
England	94	1,123,650
France	70	616,620
United States	46	494,174
Germany	45	356,016
Russia	40	373,160
Italy	24	263,624
Japan	15	154,187

NOW AVAILABLE.

Nation.	Total number.	Total tonnage.
England	64	764,200
France	54	418,294
Germany	35	240,001
Russia	34	292,630
United States	24	177,174
Italy	16	167,777
Japan	15	154,187

From another point of view, that of the inclusion of all vessels built or authorized, from battleships to torpedo boats, the United States navy is seventh in point of numbers but third in point of tonnage. This leads to the self-evident conclusion that the United States possesses or will possess more large vessels than any nation except England or France. Considering only the number of ships authorized or building, including the three battleships of the Vermont class, and the two battleships of the Mississippi class, provided for by the congress which concluded its work Mar. 4, Capt. Sigsbee places the United States second in number of tonnage, but combining the list of vessels built with that of vessels authorized or building the results show that this government is third in point of numbers and total tonnage at the present time.

PAPERS TO BE READ BY NAVAL ARCHITECTS.

A meeting of the Institution of Naval Architects will be held in the Hall of the Society of Arts, London, April 1, 2 and 3. The Earl of Glasgow, president of the institution, will occupy the chair. Papers to be read are: "Effects of Modern Accessories on Size and Cost of Warships," by W. H. Whiting, assistant director of construction, British navy; "Lines of Fast Cruisers," by Vice-Admiral C. C. P. FitzGerald, British navy; "Training of Engineers in the United States," by Prof. W. E. Dalby; "Modification of Mean Pitch due to Twisting the Blades in Screw Propellers," by Prof. Angelo Scribanti; "Lyungstrom Condenser as Applied to Marine Purposes," by W. Cross; "The Screw as a Means of Propulsion for Shallow-Draught Vessels," by A. F. Yarrow; "Ballasting of Steamers for North Atlantic Voyages," by S. J. P. Thearle; "On Marine Installations for the Carriage of Refrigerated Cargoes," by R. Balfour, engineer surveyor of Lloyd's Register; "Fitting-Out Wharf Crane Service in American Ship Yards," by W. A. Fairburn of New London, Conn.; "On Corrosion of Metal Pipes on Board Ships," by A. W. Stewart.

Upon the request of the sultan of Turkey Miss Alice Roosevelt, daughter of President Roosevelt, will christen the Turkish cruiser Medjidia when that vessel is launched from Cramps in May.

SCOTCH SHIP BUILDING LETTER.

Reduced Wages Among Engineering Employes—Lull in the Building of Big Steamers—General Shipping News.

Glasgow, Mar. 24.—A chief event this week is the conference between the executive councils of the Federation of Engineering Employers and of the Amalgamated Society of Engineers and its ally the Machine Workers' Union, with regard to the proposed reduction in wages in the engine shops. For the Clyde district the employers proposed the same reduction as that recently arranged with the ship yard workers, that is to say about 5 per cent. in piece rates and as near as may be in time rates. The north of England employers proposed a reduction of 2s. per week in all wages over 30s. per week, 1s. 6d. in wages between 25s. and 30s., and 1s. in wages under 25s., with 5 per cent. off piece rates. The conference agreed to recommend the Clyde men to accept the reduction, and the employers to begin it on May 1, not on Mar. 16 as proposed. In the case of the north of England it was agreed to recommend a reduction of 1s. per week in all time rates and of 2½ per cent. in piece rates, also to date from May 1. Under this arrangement, which will doubtless be confirmed in the localities, the men will get two months longer at the old wages than did the ship yard workers, but this is justified on their side by the contention that only a portion of the machinists who come under the award work in the marine engine shops, and that in other branches of engineering there is no depression. Unhappily, the ship building industry is still depressed by the rise in the costs of material, the speculation in the metal markets having raised the prices of the manufactured products. Only a few fresh contracts have been booked, and meanwhile steel ship plates have been advanced in Scotland to £6 per ton.

Mr. W. J. Pirrie of Harland & Wolff said in connection with the launch of the Celtic that if vessels of 50,000 tons were required he saw no difficulty, as a builder, in supplying them. But there seems to be now a lull in the building of big steamers, due to the question of dock accommodation. With the existing facilities much of the natural economy of the very largest class of steamers is lost. The dock boards have their own views on the subject, and are quite entitled to hold them, but it seems that owing to the difficulty of operating them in port ships of the Celtic class are not remunerative. There is, therefore, to be a reversion to smaller steamers, following the Cunard company, who have shown preference for boats of the Carpathia type. It is a tribute to them to have their lead followed by the Morgan combine, which is now, it is stated, to discard additions to the monsters for vessels of less imposing dimensions. When docks and port facilities generally make their construction less risky financially we shall again have leviathans, but in the meantime smaller vessels than either the Celtic or the Cedric are to be the limit. The Cymric is the chosen type. The Celtic and the Cedric are amplifications of the idea of the intermediate boat which were originally embodied in the Cymric, and the new Arabic, though smaller (she is about 15,800 tons), is in the same line. The limit in point of size—so far as the combine is concerned—is to be the Arabic. This, at all events, is the story here.

REPORT OF HAMBURG-AMERICAN COMPANY.

According to the report of the Hamburg-American Steamship Co. for 1902, the total receipts showed a decrease of 3,190,000 marks. A dividend of 4½ per cent. was paid on the ordinary shares, as against 6 per cent. in 1901. The report points out that 1902 was a specially bad year, owing to the depression of the freight market and the competitions of tramp steamers. Owing to the injury to the Deutschland, the passenger traffic also suffered. With regard to the Morgan combine, the report says experience has shown that co-operation with it has been favorable to both sides. The report regrets that subsidies (?) have been granted by the British government to the Cunard Line. With regard to the future, it remarks that the freight difficulty has been overcome, and an increase of passenger business is expected; but the future depends on the conclusion of satisfactory commercial treaties with other nations. Referring to German legislation with regard to meat imports, it complains that at least 23,000,000 marks went to English lines last year in the form of freight charges on meat imports from the United States, whereas German lines were precluded from earning similar sums by the tariff restrictions. It is stated that five new steamers are being built. The completion of one, which was ordered some time ago from Harland & Wolff of Belfast, has been suspended, in view of the changed conditions.

QUESTION OF SUBSIDIES AND AMERICAN COMPETITION.

At the annual dinner of the Glasgow Shipowners' Association, Mr. Henry Watson, president, speaking of matters affecting the shipping interest, said there had been some commotion about thq American shipping subsidy bill. Such a bill, he thought, might be detrimental to British shipping. Even if the committee of the house of commons had reported in favor of subsidies to British shipping, he did not think parliament would have sanctioned such a large expenditure, and the general sense of the shipping interest seemed to be against the payment of anything except for services rendered, such as the carrying of mails or the preparedness for war purposes. The question of the yearly increase of foreign seamen, and decrease of British seamen, in our merchant navy was one which had always called for consideration. He did not think, however, that it was a very burning question. The shortness of men for the navy was a question which came more home to them. He thought, however, that if the admiralty provided increased pay and better conditions of service they would have no difficulty in getting all the men they required. He expressed the wish that more apprentices were taken in sailing ships, and remarked that only one-thirteenth of the number were enrolled in 1900, as compared with the year 1845. On the question of light dues, he said that although it was unlikely that parliament would consent to the abolition of these dues, and so throw the expense of the lighting of our coasts upon the country, it was as well to keep up the agitation. He considered the lighting authorities charged too much. They were accumulating large sums of money yearly, which were laid by, for what purpose he did not know. This would be reasonable if they were a limited liability company, but all they needed was a margin for contingencies. He did not think it was fair, either, that warships were exempted from these dues. Speaking of the great combinations in America, he considered that they did not augur favorably for the tramp owners. Just as the trade of the world left the sailing vessels and went to the steamers, so the trade of the world was leaving the tramp steamers and going to the liners. There were clouds in the sky with no silver lining and no edge of gold. But let them take heart and be of good courage, and the clouds would depart, the sky would clear, and they would again stand in the light of the sun.

LIGHT LOAD LINE PROBLEM.

As there are two sides to every question it is not surprising there should be wide diversity of opinion on the subject of the light load line, as revealed in the evidence before the select committee of the house of lords. For instance, Capt. W. Erskine, Argyllshire, one of the home office nautical assessors, said he had held inquiries all over the country. He did not think sailing ships were very much under-ballasted, if at all. He did not attribute the loss of vessels to under-ballasting, but he considered that there was no provision made in those vessels for the proper securing of ballast. The bulk of the ballast was usually in the main hatch, and he attributed the loss of many vessels during some years back almost entirely to the want of proper shifting boards. Nearly all tramp steamers were under-ballasted, and he advocated the application of a light load line. On the other hand, Mr. McGlashan, naval architect and engineer of Newcastle on Tyne, said he thought a line ought to be assigned to each ship showing the minimum draught at which it would be allowed to proceed to sea. That line ought to be drawn with great regard to the interests of the ship owners, who ought not to be hampered unduly. And Capt. Cunninghame, nautical assessor of London, expressed himself in favor of a light load line. He said that one might as well try to steer a "peerie" as some of the vessels that went to sea. Then Capt. W. G. Melville, nautical assessor of Aberdeen, said that he had been at sea for thirty-five years, and for twenty-nine years he was a shipmaster. He had no hesitation in saying that British ships were sent to sea in an unseaworthy condition by reason of their being insufficiently or improperly balanced. He had heard a great many opinions, especially in regard to vessels built for the cotton trade, which had clear holds from bulkhead to bulkhead. When those vessels got into a gale they lay in the trough. Those ships went across the Atlantic to the cotton ports. Every possible space in the vessels was given up for cargo, even the side bunkers. From his own experience he had found that one-third of the dead-weight capacity of a sailing vessel was quite sufficient for ballasting her properly, and in the case of a tramp steamer one-third of the gross registered tonnage. That would be a safe light load line. Shipmasters took their ships to sea without sufficient ballast because they had no option. The masters had now no power whatever to deal with the question, although they formerly had. Modern ships were more difficult because they floated lighter, and were more of a box shape. Sailing vessels in tow should also, in his opinion, have a light load line.

Russell & Co., Port Glasgow, launched a day or two ago a steel awning-deck screw steamer of the following dimensions: Length, 230 ft.; breadth, 37 ft.; depth, molded, 16 ft.; dead-weight carrying capacity, 1,950 tons. This vessel is for the Canadian lake service, and she has been built to the order of the New Ontario Steamship Co., Ltd., per Messrs. R. O. & A. B. MacKay, Hamilton, Ont. She was named Wahcondah, and after the launch was towed to Greenock, where the machinery is being fitted on board by J. G. Kincaid & Co.

As showing the economy of haulage on canals it may be mentioned that on the Weaver navigation system a single horse hauls a cargo of 100 tons, and a load of 250 to 300 tons only requires two horses. Economy does not stop at haulage; it is assisted by the small cost of plant. A railway train, loaded with 220 tons, costs for engine and trucks about $18,500, while the steam barge to carry the same weight costs $8,000, and this barge is frequently used to tow three other barges of 260 tons capacity costing $5,000 each. These figures are taken from an interesting little book entitled "The Canal System of England" by Mr. H. Gordon Thompson.

DESCRIPTION OF SHAMROCK III.

Several Points of Noteworthy Interest About Her—Departures in Design as Compared with the Other Shamrocks.

London Mar. 24.—Some points about Shamrock III., recently launched, will prove entertaining to readers of the Review. Apart from the design of the challenger, there are a number of points about the boat which are noteworthy. Remembering the fact that the huge lead keel of Shamrock I. twisted through its own weight in the casting, Mr. Fife, the designer, decided on this occasion to follow the plan adopted in the building of Shamrock II. The frames were accordingly carried right down until they met at the bottom of the lead casting. The lead, is therefore, carried slung inside the frames instead of being bolted outside, and it is claimed that by this method greater rigidity is obtained. As the running of the whole quantity of lead—something over 90 tons—in one operation would heat and might even warp the frames, it was done by installments of about a ton a day. In the shell of the hull the ends of the plates are accurately fitted butt to butt, the top and bottom edges being overlapped. Inside there are straps of steel along each seam, the joint being made good with a couple of rows of small rivets on the outside. These rivets are countersunk, and the whole plate and joint burnished dead smooth. There has been no attempt on the part of the designer to copy the Herreshoff system of longitudinal framing. The boat is framed in the same style as are the composite racing yachts of recent construction, the only notable difference being that her frames are noticeably lighter than those generally used in a first-class racer, and are spaced rather more closely than is usual. The "pull" of the immense spars and wide sail area calls, of course, for some special strengthening of the shell-like hull in order to keep it in shape when hard pressed, and this is supplied in the form of steel straps and ties brought up from the edge of the keel plates and led diagonally, some of them to the framing of the top sides and others close under the steel angle which takes the place of the covering board in the neighborhood of the chain plates, where the chief "pull" of the rigging will come. These straps are exceptionally heavy and placed closely enough to form a perfect web. Similar care has been taken to strengthen the step of the mast and the deck-collar in which it is carried. The step has been built up solid, and the collar is bolted to the deck beams, and further held in position by a number of strong stays, which come with a good deal of spread from the collar to near the bottom turn of the "timbering." The hull plating plays a comparatively unimportant part in the strengthening of the vessel. The lower plates are moderately heavy, but the plating of the top sides is so thin as to leave it almost a matter for wonder how the countersunk heads of the rivets get their bed. The strength of the hull is, however, amply provided in the framing, and the chief service rendered by the plates is to make a watertight casing for the frame.

The deck is the only part of the yacht in which aluminum has been used. The close spacing of the deck beams has made it possibly to employ very thin aluminum plates, and these have been covered with a sheathing made of wood fiber. The reason why such a small quantity of aluminum has been used in a vessel in which lightness is so great a consideration is that the experience of Shamrock I. proved that when this metal is brought into contact with salt water one cannot rely upon it, no matter what kind of preservative covering is used. The plates stripped a couple of years ago from the top sides of the first challenger were badly pitted all over, while the deck plates were still sound and good under their covering of canvas.

By the courtesy of the owner an opportunity was afforded to a few persons to inspect the new vessel's lines and details before the actual ceremony of launching. She embodies more novelties of type and design than any boat yet built in this country for America cup matches. Her general dimensions, being practically dictated by the conditions of the contest, are in great degree similar to those of her immediate predecessors; but in the molding of the boat within those limits Mr. Fife has displayed a considerable amount of originality. On the water line the vessel is, like her predecessors, well up to the allowed length limit of 90 ft. but in over-all length she looks, judged by the eyes alone, to go a little bevond the measurements of Shamrock I. or Shamrock II. With a 25-ft. overhang forward and an equal length of counter, the over-all length cannot be short of 140 ft. The pontoons which were attached to the hull, one on either side of the fin, made it difficult to get a full and perfect idea of the contour of the yacht, but from what was visible it was apparent that the designer has on this occasion departed to some considerable extent from the flat-bottomed, deep-finned type, adapted from the American centerboard boats and hitherto considered the only possible form for a cup racer, and gone some way towards a reproduction of the deep-bodied hull once characteristic of the British racing cutter. The hard bilges, flat floor and acutely-angled garboards of the recent challengers have given place in the new vessel to a hull which turns easily from side to floor, drops at an easy angle, and turns again to the fin with an easy curve, forming a boat of fuller bodv than has been given to any recent cup racer on either side of the Atlantic.

The most characteristic, and in some respects the most daring, departure in the design of Shamrock III. lies in the fact that the length of fin has been shortened to an extraordinary extent. One of the principal problems which has faced the designers of 90-ft. racers has been the difficulty of balancing a craft of 130 ft. to 140 ft. over-all length, carrying an immense area of canvas, upon a keel and fin which varied from 30 ft. to 40 ft. in length. Mr. Fife has made so light of this difficulty as to cut down the fin of the latest challenger in such a manner as to leave it onlv about 20 ft. long. The advantages to be derived from a shortened fin are, of course, decreased friction, and quicker turning—two points which tell forcibly in windward work. The danger lies in the difficulty of balancing so long and heavily-canvassed a boat upon this shortened base. Whether this danger has been successfully met will be proved only in the trials, but it is so obvious that one declines to think that Mr. Fife has deliberately adopted this plan without making certain that he was on safe lines. A striking feature of the fin is the manner in which the bulk of the lead casting is thrown into the forward end, giving a distinct bulge there and a fine sweep aft. This principle was adopted first by Mr. Fife in the 40-rater Isolde and was proved by the record of that boat to be sound. While shorter than the fin of recent beoats, that of Shamrock III. is also shallower and suggests the old-fashioned keel more than the fin of the extreme modern cup racer. The new vessel will be found to draw about 19 ft. of water—3 ft. less than Shamrock I., and over a foot less than Shamrock II.

The deck lines run without a suspicion of hardness or of too sudden contraction. The greatest beam lies well abaft the main rigging, but there she measures less than the extreme beam of Shamrock II The new challenger, however, carries her beam more regularly fore and aft than the Watson boat, and therefore more effectively than did the last cutter. The full bow which proved such a serious handicap to Shamrock II. when "smashing" into a head sea has given place in this vessel to one longer, finer drawn, and of sharper sections, giving the impression that she will make an entrance in any kind of sea. Fore and aft the lines are carried in an easy sweep with moderate fulness to the flanks and counter, thus giving a long powerful sailing side when the boat lists in any weight of wind. The stern post is raked to an acute angle, and the tiller, which hitherto has been invariably used in British boats, has been displaced in favor of the American system of steering with a wheel, a change due probably to a preference developed by Wringe, the skipper of the new yacht, during his racing in American waters.

MINERAL PRODUCTION OF NOVA SCOTIA.

The report of Dr. Edwin Gilpen, Jr., inspector of mines of Nova Scotia, for the year ending Sept. 30, 1902, gives the following statement of production:

		1901.	1902.
Gold	oz.	30,537	28,279
Iron ore mined	tons.	.....	15,214
Iron ore imported	tons.	419,567	474,517
Manganese ores	tons.	10	150
Coal raised	tons.	3,625,365	4,362,869
Coke made	tons.	120,000	406,152
Gypsum	tons.	135,637	173,000
Grindstones, etc.	tons.	315	4,000
Limestone	tons.	95,794	223,606
Barytes	tons.	600	742
Pig iron	tons.	90,034	206,193
Moulding sand	tons.	.....	1,390

The figures above give the returns of coal mined. The coal sold in 1902 was 3,898,626 tons, which was distributed as follows: Nova Scotia, 1,382,563 tons; New Brunswick, 319,338; Prince Edward island, 56,203; Newfoundland, 105,287; Quebec, 1,243,980; West Indies, 5,982; United States, 751,382; other countries, 33,891. The sale of coal in Nova Scotia increased 383,749 tons, due principally to the requirements of the Dominion Iron & Steel Co., which drew its supply for coke and other purposes from the Dominion Coal Co. The sales to New Brunswick show a slight decrease. The sales to the United States showed an increase of 200,000 tons.

According to a consular report an industry of much importance to American paint manufacturers has sprung into existence in Malaga. A rich vein of oxide of iron ore—valuable chiefly for the manufacture of red paint for structural iron work—has been discovered near the city of Jaen, about 85 miles from Malaga. The ore is shipped both in its crude state and refined, ready for mixing with oil. Levigation is effected by submitting the crude ore to the process of grinding by stone crushers. It is then forced through filters of purified water and finally dried in kilns. The result is a fine red powder, which, mixed with a trifle more than 10 per cent. of linseed oil, produces paint ready for use. Iron structural work of all kinds is usually protected by a coating of this paint. Interest attaches to the industry in view of the marked decrease of 31 per cent. in the production of hematite in the United States in 1901. This fact has encouraged Spanish exporters to renew their efforts to establish in America a market for their product and all signs indicate that they are meeting with success.

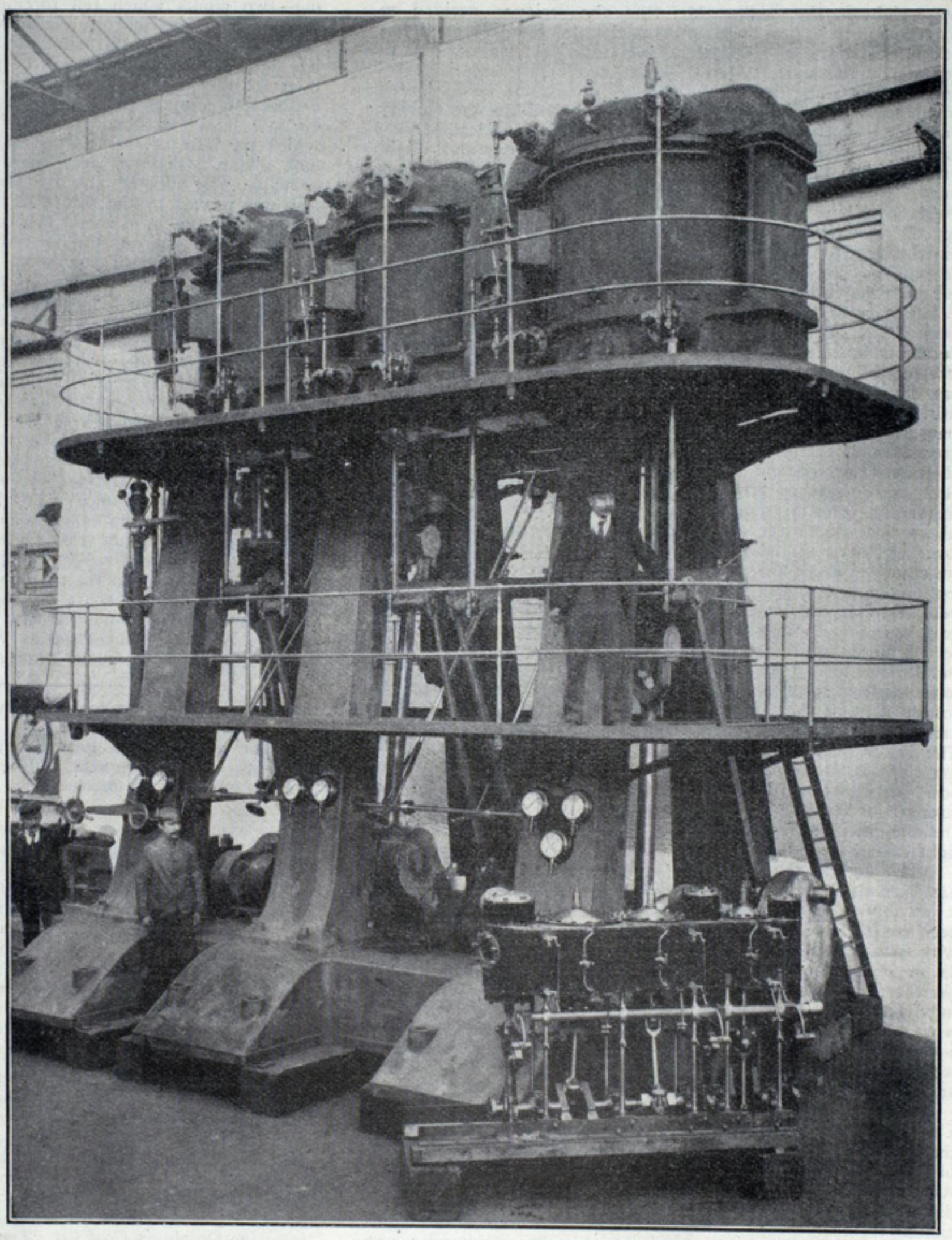
INITIAL LINE BETWEEN BRISTOL AND NEW YORK.

With the abandonment of the Old State House at Boston by the New York, New Haven & Hartford Railroad Co. come recollections of a most important era in the history of the coastwise passenger service, a time when the whole country became interested in the establishment of a line of palatial steamers between Bristol and New York. When inaugurated the line was known as the Merchants' Steamship Co. and under this title it was operated for about one year when it was bought out by James Fisk. There were only two boats in service, the Bristol and Providence, which were more luxurious and magnificent than any of their type ever seen before. Connection with the port of Bristol was by way of the Boston & Providence railroad, and soon after Fisk took the presidency of the new concern the business showed a tremendous increase and it frequently happened that the demand for accommodations greatly exceeded the capacity of the steamers. Thousands of people were attracted to them simply out of curiosity and their gorgeousness afforded material for conversation from one end of the coast to the other. The beginning of the enterprise now known as the Fall River Line was in 1827 when the public was advised that the steamer Marco Bozarris would begin regular trips between Dighton and New York, making stops at Fall River.

In 1826 the steamer Hancock was placed upon a line between Fall River and Providence. This was the first steamer run regularly in these waters; and in that year Fall River first became a steamboat terminus. In 1846 Fall River and Boston were first connected by railroad, thus making possible the establishment of a "through line" between Boston and New York. In 1847 Col. Richard Borden of Fall River, with his brother, Jefferson Borden, did actually inaugurate such a line, beginning the enterprise with a capital of $300,000; and thus practically was established the Fall River line.

The steamboats of this line succeeded each other rapidly, and in ever increasing ratio of bulk and magnificence. Following the Eudora, built in 1845, came the Bay State, the finest specimen of marine construction of her class in her day. Her alternate was the steamer Massachusetts. In 1848 the Empire State was launched and took her place in the line, and in 1854 she was joined by the Metropolis, the finest steamboat of the period in eastern waters. In 1850 the steamboat State of Maine was added to the fleet. In 1864, the Old Colony railroad, having extended its tracks to Newport, that city was made the eastern terminus for the boats of the Fall River Line. In 1869, however, the terminus was again established at Fall River, all interested having become convinced that the latter city afforded the most popular and convenient point for location. In 1865 the steamboats Newport and Old Colony were added to the line. In 1867 were added to its fleet the two famous steamboats, the Bristol and Providence, twin boats, 375 ft. long, 84 ft. beam and of 3,000 tons measurement each. In 1874 the line became the property of the Old Colony Steamboat Co., in whose ownership it remained until the absorption of the Old Colony railroad by the New York, New Haven & Hartford. And these, in brief, are the material facts in the history of this well known marine property.

Mr. Shiverick continued in charge of the Old State House office until 1874, when he was succeeded by L. H. Palmer, the present up-town agent of the company. Shortly after Fisk came into possession of the line he made it a custom to visit the State street office two or three times a week, and these occasions were attended by widespread curiosity to see the man whose name was on everybody's tongue. Sometimes he would drive up to the Washington street entrance in a highly decorated covered carriage drawn by four white horses, the metal of the harness of dazzling brilliancy, the coachman of grenadier proportions, and as stiff and straight. Fisk was always immaculate in his attire, and in his shirt front sparkled an enormous diamond. Occasionally he would come with four dapple grays, and at others with a white and black hitched together, but always with two spans. Men and boys would crowd in behind his elegant equipages as he drove up Washington street, and by the time he reached the office the street would be crowded. The more curious climbed upon the window sills to get a sight of him while inside and when he emerged it was with great difficulty that he made his way through the throngs that surrounded the door. He was a genial good fellow, and, while given to making a show and delighting in the sensation he created when driving through the



DIGNITY AND IMPUDENCE.

This photograph was taken in the workshops of Messrs. Yarrow & Co., at Poplar, England. It represents two types of engines, both indicating the same horse power The large engines are for the East London Waterworks Co., and the small engines for propelling a torpedo boat.

streets, yet there was a strain of democracy running through his nature which was at all times manifest.

It is not positively known whether Fisk's frequent visits to the office were for the purpose of inquiring into the business of the company or receiving the attention of the thousands that his presence attracted. When among the boys at the office he was jolly and affable, and never failed to hand one of the clerks a bill, with instructions to go out and get a package of cigars, and with the injunction that they were to cost not less than 50 cents apiece. This unique figure finally took up his residence in New York, and one of the sights of the street was lost forever.

The Bristol and Providence continued in service for a number of years, and retained their popularity to the end. The former passed out of service while at her pier in New York through fire, and about one year ago the Providence was broken up. The New Haven road abandoned the old office this week, taking up new quarters on Washington street.

SHIP BUILDING AT NEWPORT NEWS.

Newport News, Va., April 1.—The second foreign warship to be docked for repairs in the United States will be the German cruiser Gazelle, which will arrive at the ship yard from South American waters probably the latter part of this week. The Gazelle was one of the German blockading warships in Venezuelan waters. So was the cruiser Vineta, flagship of Commodore Scheder, which was overhauled here last fall and was the first foreign ship of war to be floated into an American dry dock. So well satisfied were the German officers with the work done on the Vineta that they contracted to have the Gazelle overhauled, and it is not unlikely that when the latter ship leaves the small cruiser Falke, which is attached to Germany's south Atlantic squadron, will come to Newport News. The German government argues that it is much more economical to send its warships into American waters to Newport News to be overhauled than it is to order them back to Germany, when the work can be done just as satisfactorily and just as reasonably here. The Gazelle will not go out of commission while here, her officers and crew remaining aboard all the time and carrying out their daily routine.

The Pacific coast lumber steamer Francis H. Leggitt is rapidly approaching completion and will soon be ready for her builder's trial. It is reported that the Hammond Lumber Co. of San Francisco, for whom this steamer is being built, will have four more ships built after similar design, in which event the Newport News yard would probably be a bidder and would stand an excellent chance of getting probably all of them to construct. The Leggitt is building for the red-wood traffic along the coast of California. She is probably the staunchest and most seawortny vessel of her size ever constructed in America. No expense has been spared in her construction and it is said that she will cost something like $200,000 when completed. For a lumber steamer of less than 2,000 gross tons this is no small outlay. The officers of the Leggitt are now here and will take her out as soon as she is turned over to her owners.

The battleship division of the North Atlantic squadron under Rear Admiral Francis J. Higginson, is expected to arrive here about May 20 to prepare for review and general inspection by Admiral Dewey, which will last for ten days or more. The ships will coal here, in all probability, and it is stated that after the review some of them will be docked here and cleaned and painted preparatory to the summer cruise to the Azores. The review of the battleships will take place outside of the Virginia capes on the southern drill ground. The ships which will arrive here are the Kearsarge, Capt. J. N. Hemphill, flagship; Maine, Capt. E. H. C. Leutze; Illinois, Capt. G. A. Converse; Alabama, Capt. C. H. Davis; Iowa, Capt. T. Perry; Indiana, Capt. William H. Emory; Massachusetts, Capt H. N. Manney; Texas, Capt. W. T. Swinburne, and the dispatch boat Scorpion, Lieut. Com. C. J. Boush.

Rear Admiral Bowles, chief constructor of the navy, and Naval Constructor Washington L. Capps, who is stationed at the Brooklyn navy yard, were visitors to the ship yard the other day. They came to note the progress on warships building here and especially to view the 16,000-ton battleship Louisiana, which is making unusually fast headway on the ways. The sister ship Connecticut, which is being constructed under the direction of Constructor Capps at the Brooklyn navy yard is not nearly as far advanced as the Louisiana. Admiral Bowles expressed himself as highly pleased with the excellent work that is being done here. Before returning to Washington the two naval officers visited the navy yard on business.

It is probable that an early adjustment will be made of the differences existing between the navy department and the owners of the Schmoele tract, adjoining the navy yard, on which it is proposed to build a new dry dock and make other extensive improvements.

The Old Dominion liner Monroe (new steamer) is expected to leave the ship yard for New York the latter part of this week or early next week.

Estimates just submitted to parliament at Ottawa include an item of $94,000 for the Canadian canal at Sault Ste. Marie. This is an increase over last year of $44,000.

A HEAVY LOSS.

Editor Marine Review:—Whether by subsidies or in some other form is it essential that congressional aid of some kind be afforded to give the United States an ocean marine worthy of its position in the world's trade. Statistics show that we are paying freights to foreigners on 92 per cent. of our exports and imports. That is the result on an average of the whole commerce, but there are instances where the result it far worse. For instance, our trade with the Philippines: In 1902 94 per cent. of our shipments was carried in vessels flying the flags of other countries, and 99 per cent. of what the Philippines sent us was carried in vessels clearing under foreign flags. It is certainly humiliating that other vessels than those flying the American flag have to be used to carry to and foreign flags. It is certainly humiliating that other vessels than those flying the American flag have to be used to carry to and fro practically all the shipments between the "old homestead" and its family connections. A study of the earnings of foreign shipping lines, compared with the total investment in ships of those lines, shows enormous profits in which we are not sharing, but toward which we are contributing:

	Value of fleet	Gross earnings, 1902.
Peninsular & Oriental	$13,685,983	$15,236,681
Messageries Maritimes	19,403,422	13,564,750
Nippon Yusen (Japanese)	11,146,844	11,640,708

These three lines are engaged mainly in the business of the orient, where our business is growing, and to which region of the world we must look for new and enlarged markets to increase our foreign trade and help our 525,000 factories and 7,000,000 factory workers. The above figures are striking. The Peninsular & Oriental, a British line, earned in gross its entire investment in one year and $1,550,698 over. The Nippon Yusen also covered its investment and $493,864 over. For the two lines all their investment of $24,832,827 and $2,044,562 over, or a total earning in one year of $26,877,389 for our two chief rivals in the orient. It would be of interest to know how much of the $213,000,000 we lost last year in ocean freights went to help put this $26,877,839 in foreign pockets. But that is not all. Other foreign companies earned as follows:

General Italian Navigation Co.	$9,671,124
Compagnie General Transatlantique	9,558,542
Pacific Steam Navigation Co. (British)	7,729,295
Cunard Line	6,777,853
British Royal Mail Line	4,126,470

Including the smaller lines, a total gross earning of $83,484,387 for passenger lines is reported, against a book value of $99,681,983 and a tonnage of 1,597,474. Nineteen reporting cargo lines earned during the year $32,408,390, of which the Prince Line earned $3,829,651 on a fleet valued at $3,160,094.

Foreign cargo steamers of 17,000,000 tonnage earned $580,000,000 last year, and the foreign passenger steamers of 4,000,000 tons more earned $200,000,000, or a total of $880,000,000 earnings by foreign passenger and cargo steamers, toward which we contributed $213,000,000, or nearly one-fourth of the total foreign ships' earnings. As far as we are concerned this is all dead wrong and is entirely the fault (by neglect) of our law makers. But, may say the opponents of subsidies for American ships, these earnings of $880,000,000 are largely made up of "government pay" (as they call it). Not so; the subsidies granted by the foreign governments were to eleven of the passenger lines and amount to just $12,000,000 of the $83,484,387 earned by those lines, and for those subsidies they performed certain services and obligated themselves to perform certain other services if called upon, just as our bill proposed, though ours was the more stringent.,

The simple but insistent fact remains: We need an ocean marine as badly as we ever needed anything in the history of the nation; as badly as in 1897 our factories needed a protective tariff and got it. The result of that wise move speaks for itself in each and every avenue of trade. Why not stop this $213,000,000 yearly leak by also protecting our shipping interests?

Schenectady, N. Y., Mar. 29. WALTER J. BALLARD.

Machine tool makers will be interested in the naval appropriation bill recently passed. The sum of $150,000 is appropriated for improvements to the Washington navy yard. The Portsmouth navy yard gets $916,000 and the Boston navy yard $290,500. For the improvements to be made at the New York navy yard $298,500 is appropriated. Among the items $30,000 will be expended for electric plant extension. At the League Island navy yard there will be expended $309,200 for various improvements. The sum of $25,000 is to be expended to complete the machine shops for the bureau of steam engineering. At the Norfolk navy yard $193,000 will be expended. The sum of $188,000 is appropriated for Mare Island navy yard and $295,000 for the Puget Sound navy yard. Liberal appropriations are also made for the various naval stations.

The president of the board of trade, Mr. Gerald Balfour, has announced in the house of commons that a formal agreement between the British government and the International Mercantile Marine Co. will be ready for signature before Easter.

NEWS OF THE GREAT LAKES

SETTLEMENT WITH COAL AND ORE DOCK WORKERS.

After daily conferences extending over more than two weeks, the managers of coal and ore docks at Lake Erie ports and the representatives of the several unions of ore and coal shovelers, hoisters, dock engineers, firemen, laborers, etc., all united in the International Longshoremen, Marine & Transport Workers' Association, on Saturday last signed contracts covering every phase of the dock work for the coming year. Wages are advanced all along the line. Stated briefly the advance is 1 cent a ton over 1902 for the ore shovelers and practically 7½ per cent. advance over 1902 wages for all other classes of labor. The difficulty presented by the new automatic ore unloading machines, which leave parts of cargoes to be unloaded by the shovelers, was overcome by giving the men a higher tonnage rate for unloading these parts of cargoes—up to 18 cents a ton, graded according to the amounts which to mechanics fail to remove. In the following paragraphs no attempt is made to go into the details of the agreement, but the essential points are brought out:

Ore shovelers—Eleven hours to constitute a day's work; 14 cents a ton for shoveling; 25 cents an hour for overtime; 8 cents a ton for loading ore from dock by machine and 10 cents by hand; transferring from cars to docks, 21½ cents per hour; all day work at rate of 21½ cents per hour; 7½ per cent. advance over last year for all work not specially provided for; no work on Sundays or legal holidays unless vessel is in wrecked condition, with water in hold, and in such event double tonnage shall be paid with overtime at 25 cents per hour to each man employed.

Coal handlers, trimmers, brakemen and laborers: Fuel dock work—Unloading from gondola cars to docks, 5½ cents a ton; wheeling from dock to vessel and trimming in bunkers, 20 cents a ton; shoveling into buckets and trimming in bunkers, 19 cents a ton; trimming bunker coal put aboard through chutes, 8½ cents a ton; wheeling from dock to vesel (no trimming), 11½ cents a ton; no overtime on fuel docks or fuel lighters. Fuel lighter work—Unloading from gondola cars and trimming in bunkers of vessels, 21 cents a ton; trimming in bunkers of vessels, lighters being loaded by dock company, 12 cents a ton; unloading hopper cars and loading lighters through chutes, and trimming into bunkers of vessels, 15 cents a ton. Cargo dock work—Eleven hours to constitute a day; trimming coal put aboard vessel either by car dump or trestles, 3 cents a ton for vessels of 1,000 tons or less, 2½ cents for vessels over 1,000 tons; trimming fuel put aboard by car dump or trestle, 8½ cents a ton; unloading cars by hand into buckets, the same to be swung aboard by machines, including all labor, 12 cents a ton; Sunday work when necessary, but double tonnage to be allowed; day labor, 21½ cents per hour, with 33 cents an hour for overtime; 7½ per cent advance over 1902, rate for labor not specially provided for.

Hoisters, engineers and firemen—Eleven hours to constitute a day's work; wages $80 a month, except at Cleveland and Buffalo, where engineers are to receive $85; time and a half for all overtime; time and a half for repair work on Sunday and double time for hoisters and engineers if operating on Sunday; operators on steam shovels, $91.50 a month; firemen here referred to are those employed on revolving ore derricks and they shall receive 21½ cents an hour, but this does not apply to men on Brown hoist ore, coal or car dump machines; 7½ per cent. advance over last year for operators and engineers not specially provided for; firemen and oilers on Brown hoist machines at Toledo, $60 a month; 7½ per cent. advance over last year for engineers and firemen on all car dumping machines; also 7½ per cent. advance over last year for engineers, hoisters and firemen on fueling scows and docks and for all labor not mentioned; a winter scale, based on 25 cents an hour at Cleveland and Buffalo, and 23 cents an hour at other ports for hoisters and engineers, with other labor advanced on the 7½ per cent. basis, was also adopted.

For trimmers, dumpers, pinchers and wall builders a wage of 21½ cents per hour, summer scale, was agreed upon; winter scale, 19½ cents per hour, except for men employed on and around steam shovels or grab buckets, who shall receive 20 cents per hour; dumpers on Thew automatic steam shovels, 20 cents per hour.

As the provisions regarding automatic ore-unloading machines are entirely new they are herewith printed in full:

"After boats have been worked at automatic unloading machines and are to be finished at other machines, the following rates shall apply for handling same:

"1. When the automatic machines have removed 50 per cent. or less of original cargo the rate for unloading shall be the regular tonnage rate of 14 cents per ton.

"2. When the automatic machines have removed 50 to 65 per cent., the rate for unloading shall be 15 cents per ton.

"3. When the automatic machines have removed 65 to 80 per cent., or more, the rate for unloading shall be 16½ cents per ton.

"4. When the automatic machines have removed 80 per cent. or more, the rate for unloading shall be 18 cents per ton.

"5. That men working in the holds of boats in connection with automatic machinery shall receive 25 cents per hour and shall be put to work when machines start and paid during time machinery is working in boat. Men, when called, to be furnished 5½ hours work and actual time thereafter. Overtime, time and a half. When double turns are employed they shall be at regular rate.

"6. Chief operators on Hoover & Mason and Hulett automatic machines shall receive $105 per month.

"7. All other work not mentioned to receive 7½ per cent advance over scale of 1902.

"8. Operators on standard machines and whirlies operating clam shell buckets shall receive $90 per month."

OPENING OF THE LAKE SEASON.

After continuous sessions in Cleveland for more than two weeks past with delegates from labor organizations, often running well into the night, representatives of the vessel owners and other lake shipping interests have finally cleared up everything in the way of labor agreements excepting a settlement wit.. one body of men, the firemen, oilers and water tenders. The task has not been an easy one. Probably the most satisfactory part of all the work of the Lake Carriers' committee, and for which great credit is due to the labor leaders as well as the committee, is the settlement reached on Wednesday of this week with the tugmen, who are to return to work at an increase of wages that is said to mean $11.29 a month more than last season for every licensed man in the employ of the Great Lakes Towing Co. If a settlement had been reached with the one organization still unsatisfied, the firemen, it is more than probable that a very large part of the lake fleet would be in motion this week, taking the chance of encountering considerable difficulty on account of ice. It is no fault of the executive committee of the Lake Carriers that a settlement has not been made with these men, but it must nevertheless be admitted that a very large portion of the vessel owners are quite satisfied that there is still something to prevent the movement of vessels, and many of them would be pleased to have their ships held in port for another month. In the face of all the agreements that have been made for them with the labor organizations pects of contracts at any advance over last year's rates. they have no freight contracts whatever and no pros- They have simply to depend upon the development of business enough during the season to give them increased earnings, and this is a matter of great doubt in view of increased operating expenses, an increase to 21 cents a ton for unloading ore as against 19 cents last year, much higher prices for fuel, and the certainty of a somewhat longer season of navigation. Two or three of the largest individual owners in Cleveland have actually paid bonuses on grain cargoes so as to be relieved of the obligation of starting their vessels to move grain. Of course the fleets controlled by the ore companies will be started as soon as possible but the number of vessels that prefer delay and are not disturbed by the action of the firemeen is fully as large as the number ready to start. The firemen are asking for higher wages than have been granted to other workmen that have at least been on a level with them from a wage standpoint in the past and this is the principal cause of difficulty.

CONGRESSMAN BURTON ON DETROIT BRIDGE.

In a recent interview in Detroit, Representative Theodore E. Burton, chairman of the committee on rivers and harbors, expressed himself in favor of a bridge over the Detroit river. Concerning it he said:

"I believe there are still some vessels on the great lakes which carry masts 150 ft. high, but the tendency now is to cut them down and a bridge giving 135 ft. clear space will not interfere with navigation. I am opposed to the erection of a single pier in the river but I think there will be no difficulty in spanning the river. A single span across the river would remove every objection the vessel men have ever offered."

REPAIR WORK AT CHICAGO AND MILWAUKEE.

Chicago, Ill., April 1.—The machine shops, boiler works and engineer supply concerns here and at Milwaukee and other points around Lake Michigan have had a very busy winter and with the vessels all fitting out now thev are, of course, being worked to tneir fullest capacity. The Manitowoc Dry Dock Co., operating here and in Milwaukee as well as at Manitowoc, has had more than its share of the work and no small part of the success gained by this company is due to the energy of Supt. Theodore Knudson, who is constantly making friends among the vessel men. Work done by this company includes about $20,000 worth of repairs on the steamer City of Paris—new beams under boilers, new 'tween deck beams, new outside planking, etc., etc.—as well as a considerable job on the steamer Black Rock. Other steamers that were given general repairs were the Plankinton, Germanic, Panther and W. P. Rend. New rails, some straightening of plates, etc., were included in repairs to the Fayette Brown; new stem and hatches on the Livingstone, and new hatches and new outside planking on the Cranage and the City of London. All vessels of the Ogdensburg line in Chicago were calked all over.

The Cream City Marine Boiler Works of Milwaukee has a contract for doing all boiler work on the Barry steamers at Milwaukee. They recently finished general repairs on the boilers of the steamer Monteagle and changed her from a two-stack steamer to single-stack. They also cut off water bottoms in the steamer Marion and put in new boiler pans. Mr. Felix Stuckhart of this firm is now in Port Huron looking after the placing of new back flue sheet and tubing in boilers of the steamer Waubon.

Geo. E. Corbett, boiler maker of 3-7 E. Chicago avenue, Chicago, has erected new boiler house on the steamer Pather, making also general boiler repairs on the steamers Wissahickon, Cranage, Plankinton, Parnell, City of London, Olympia and Livingstone.

Thos. B. Banner, No. 57 E. Kinzie street, whose principal work is in copper, tin and sheet iron, has been engaged in fitting out vessels of the Union Steamboat Co. and Lehigh Valley Transportation Co., and also the fleets of J. A. Calbick and the Hines Lumber Co., as well as the steamers Parnell, Spalding and Arthur Orr. He has made and installed pumping and other appliances for vessels undergoing repairs at the works of the Manitowoc Dry Dock Co. and also on two steamers at Milwaukee, the Corsica and Briton.

John Black, engineers' supplies, etc., South Chicago, has for ten or twelve years past had a regular trade, much of it of a contract kind, with vessels running to that port. He engages in sheet metal work and has had much to do in that line during the past winter. James B. Black, who is manager for his father, directed the installation of a large amount of auxiliary piping on the steamer Cornell of the Steel Corporation fleet.

DECISIONS IN TWO ADMIRALTY CASES.

The United States supreme court has just handed down two decisions of some importance to marine interests. They are known as the Osceola and Roanoke cases, both of which resulted originally in verdicts for libellants. The supreme court, however, finds for the defendants in each case. In the Osceola case a seaman named Patrick Shea sought to recover damages against the propeller Osceola in the United States district court for the eastern district of Wisconsin for injuries sustained through the alleged negligence of the ship's master. It appears that while the vessel was three miles from the port of Milwaukee the master ordered the forward port gangway hoisted, in order that the vessel might be in readiness to discharge her cargo. The vessel was proceeding against a head wind and as soon as the gangway swung clear of the ship the front end was caught by the wind, pulling the derrick over and hurting Shea. The issue was as to whether the master had been negligent. Justice Brewer answers in the negative, saying:

"The damage was not done by the ship in the ordinary sense of the word, but by a gangway, which may be assumed to be an ordinary appliance of the ship, being blown against the libellant by the force of the wind."

The Roanoke case was appealed from the United States district court for the district of Washington and was a libel against the steamer Roanoke for materials and labor alleged to have been furnished by the libellants, King and Winge, in the repair of the boat, to certain contractors with the owners, who had full charge of the alteration and repair of the steamship. One Fraser filed an intervening libel. Both libellants were given decrees and an appeal was taken by the North American Transportation Trading Co. Says Justice Brown in reversing the decrees:

"Bearing in mind that exclusive jurisdiction in all admiralty and maritime cases is vested by the constitution in federal courts, which are thereby made judges of the scope of such jurisdiction, subject, of course, to congressional legislation, the statute of the state of Washington, in so far as its attempts to control the administration of the maritime law by creating and superadding conditions for the benefit of a particular class of creditors, and thereby depriving the owners of vessels of defenses to which they would otherwise have been entitled, is an unlawful interference with that jurisdiction and to that extent is unconstitutional and void."

APPOINTMENTS OF MASTERS AND ENGINEERS.

Mueller Co., Wm., Chicago: Steamer—Mueller, Capt. Henry Dawson, Engineer G. G. Randall. Schooners—Parana, Capt. Max Delatre; Butcher Boy, Capt. H. K. Woerpel; Richard Mott, Capt. Wm. Powers; Belle Brown, Capt. Edward Johnson.

Goodrich Transportation Co., Chicago: Steamers—Columbus, Capt. Robert Smith, Engineer Joseph Wilson; Virginia, Capt. Geo. Pardee, Engineer G. R. Roth; City of Racine, Capt. John Wilson, Engineer F. Nieder; Indiana, Capt. Elmer Redner, Engineer W. B. Eles; Atlanta, Capt. Edward Taylor, Engineer J. Piratka; Iowa, Capt. John Ralleigh, Engineer J. Buschmann; Georgia, Capt. Chas. Bronson, Engineer C. H. Bron; Str. Chicago, Capt. Con. M. McCauley, Engineer ————; Sheboygan, Capt. A. E. Johnston, Engineer A. Gilbraith.

Shannon & Garey, Saginaw, Mich.: Steamers—Homer Warren, Capt. Geo. F. Recor, Engineer J. W. Bennett; Robt. Holland, Capt. W. P. Rattray, Engineer L. Van Lieu; Wyoming, Capt. C. E. Garey, Engineer Miles Gaffney; W. P. Thew, Capt. J. T. Lennin, Engineer Julius Dean. Schooners—White & Friant, Capt. James Hall; Exile, Capt. J. H. Trudo; Crosthwaite, Capt. O. W. Thompson; Ida Keith, Capt. Robt. Rabideau; T. G. Lester, Capt. T. B. Garey; Monticello, Capt. ————.

Teagan Bros., Detroit: Steamers—Samoa, Capt. J. B. Maddock, Engineer Wm. Westbrook; Chauncy Hurlbut, Capt. Jos. Parsons, Engineer Philip Thomas; Pickands, Capt. J. E. Cottrell, Engineer Fred View. Schooner—D. K. Clint, Capt. B. Peltier.

Morton, Joy, Chicago: Steamers—Marion, Capt. H. M. Boyce, Engineer E. Hidden; Minnie E. Kelton, Capt. David Beggs, Engineer Jay Phillips; Normandie, Capt. H. J. Nelson, Engineer. ————. Schooner—F. C. Leighton, Capt. M. Abrahamson.

United States Transportation Co., 1105-1106 Williamson building, Cleveland: Steamers—L. C. Smith, Capt. E. T. Rattray, Engineer Robt. Leitch; Hurlbut W. Smith, Capt. C. T. Woodward, Engineer Wm. Roach; Monroe C. Smith, Capt. Wm. Smith, Engineer John Howard; B. Lyman Smith, Capt. Frank Boyer, Engineer John Davidson; Wilbert L. Smith, Capt. Henry Stone, Engineer R. H. Benham; Wm. Nottingham, Capt. Harvey Mills, Engineer John Courtney; Geo. B. Leonard, Capt. H. F. Loftus, Engineer Geo. Oldham; Chas. M. Warner, Capt. Fred Graves, Engineer Geo. Miline; H. S. Wilkinson, Capt. Sidney Le Beau, Engineer Wm. G. Beckbissinger; W. W. Brown, Capt. A. W. Stalker, Engineer Harry Vaughn; A. G. Brower, Capt. Alex. Forbes, Engineer H. H. Reading; Wm. H. Gratwick, Capt. James Riley, Engineer Allen Landphere.

Cowle Transit Co., 1105-1106 Williamson building, Cleveland: Steamer—John B. Cowle, Capt. Bushnell H. Jones, Engineer E. A. Barker.

Mona Transportation Co., 1105-1106 Williamson building, Cleveland: Steamer—Geo. Presley, Capt. John Hergenrother, Enginer John Cooper.

AT THE GREAT LAKES ENGINEERING WORKS.

The Great Lakes Engineering Works, Detroit, will build the machinery for a large sea-going hydraulic dredge for R. A. Perry, San Francisco, Cal. The dredge is for use on the Atlantic coast and the hull is being bult by the New York Ship Building Co., Camden, N. J. The main engines are of the vertical, inverted, triple-expansion type and are to develop 1,200 H. P. at 200 revolutions per minute, condensing, with 200 lbs. steam pressure. The cylinders are of 18, 30 and 48 in. diameter with 20-in. stroke. The engines are intended as propelling engines as well as for driving the centrifugal dredging pump. The pump is located immediately forward of the engines on an extension of the bed plate, which also carries the pump thrust bearing. The propeller thrust bearing is located immediately aft of the engine bed and attached to it. When under way the pump is disconnected and the propeller shaft is coupled up and vice versa. The entire power of the engines is, of course, not used in driving the vessel, approximately two-thirds being ample for this purpose. The pump has 28 in. suction and 26 in. discharge connections. There is a quantity of other apparatus in the equipment, such as winding and hoisting machinery, engines for driving the cutters, etc.

The Great Lakes plant has now under construction machinery for four hydraulic dredges besides making alterations and additions in the shape of improved apparatus to several others. The works are crowded up to their capacity. The new ship yard is being pushed rapidly ahead. The foundation work for the buildings, in itself a large item, is nearly completed and a great part of the steel structural work is already on the ground. It is expected to be ready for keel laying in July, and if so it will be a striking instance of rapid construction. Part of the machinery is alreadv completed and ready for delivery and the rest will be finished and delivered by the time the buildings are ready to receive it.

The lightship Kewaunee has been stationed upon the southeast shoal, Point au Pelee passage, Lake Erie.

MONTREAL GRAIN ELEVATOR.

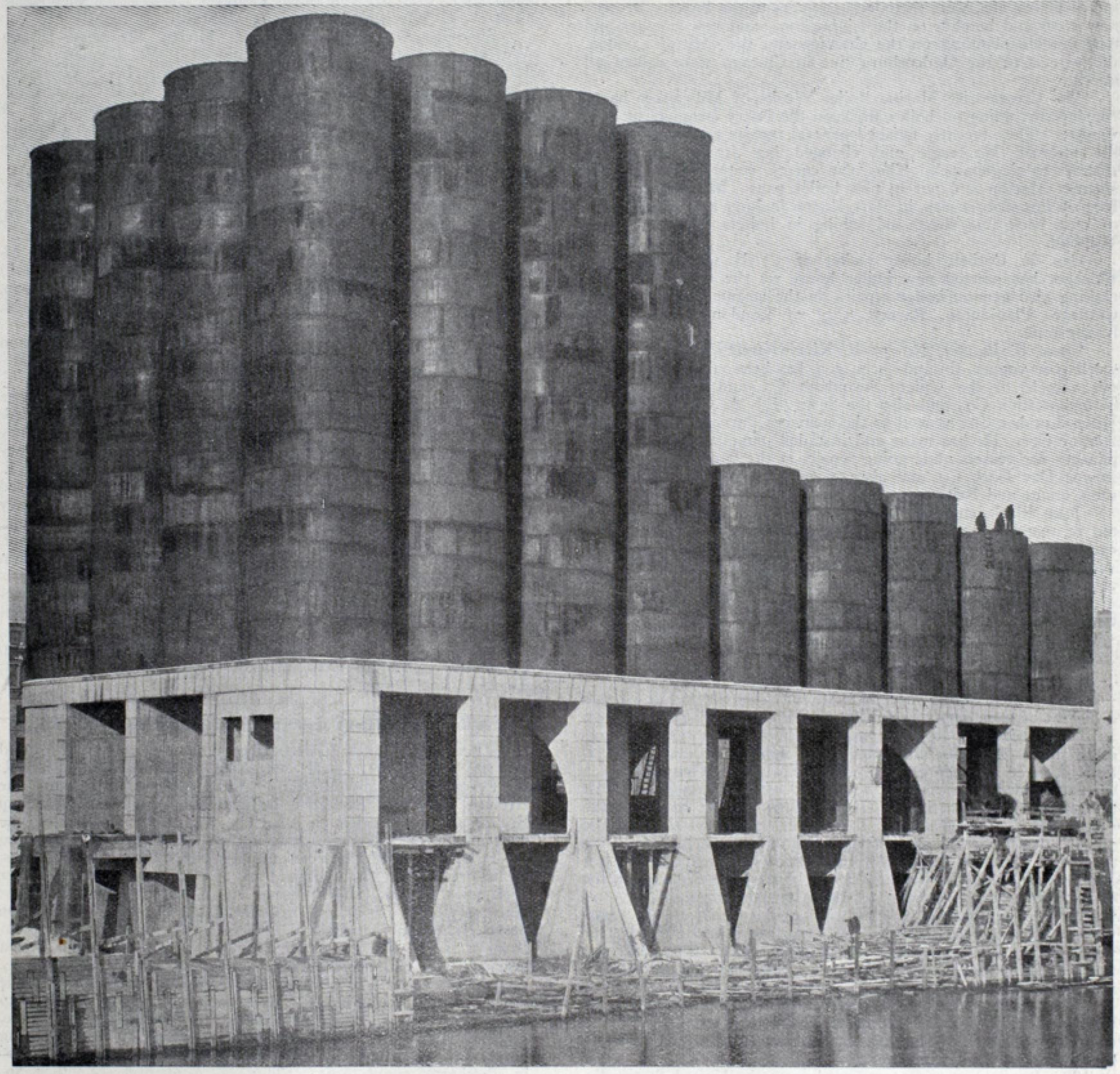
The Montreal grain elevator is one of the most modern and best equipped storage elevators erected on this continent. The contract for the elevator was awarded April 16, 1902, by the harbor commissioners of Montreal. The design for the elevator was prepared by the Steel Storage & Elevator Construction Co., Buffalo, and before awarding the contract the plans were submitted to the minister of public works for the dominion government. At his direction a board of experts examined into the plans very thoroughly and were unanimous in their approval. The time specified for the completion of the elevator is August, 1903. The elevator foundations, lower story, and all upper floors are built of concrete. The lines are cylindrical in shape, built of steel plates, with all spaces between cylindrical bins formed into smaller bins, so that the whole area is utilized for storage. The total number of bins is seventy-eight, and the total storage capacity, 1,000,000 bu.

The marine tower is built of steel and is 23 ft. wide. 33 ft. long, and 150 ft. high. It will be mounted on twenty pairs of car wheels running on four steel rails along the dock. The dock is now being built by the Steel Storage company. It consists of a middle section in front of the elevator, which will be built entirely of concrete and steel construction, supported on piles. The width of this section of dock is 33 ft., height 25 ft., and length 200 ft. At either end of the middle section is a heavy concrete retaining wall with filling behind, which will form the dock beyond the elevator. The total length of concrete dock is 600 ft., running across the inshore end of the basin between the two adjacent steamship piers. The total height of the concrete work under the elevator from pile heads to bin bottoms is 50 ft. About 25 ft. of this will be below grade when the filling is completed. Two car tracks run through the elevator.

This lower concrete story is thoroughly braced by heavy concrete arches running entirely across the building, with buttresses extending out on either side to take the thrust. The space between columns, as shown in the illustration, will be filled by a concrete curtain wall with a double window, three sashes high, in each panel, which will make a very light lower working floor. The entire outer surface of the concrete will be blocked off to resemble massive masonry, and bush-hammered all over. The top of the bins will be 110 ft. above ground level, and the cupola will run 85 ft. above this, making a total height from the ground of 195 ft.

This cupola will be structural steel throughout, with concrete floors and roof. The elevator will be equipped to receive grain either from boats or cars, and ship grain either by cars or by means of conveyors to ocean boats lying at their berths at either King Edward, Alexandria or Jacques Cartier piers, and at the basins between these piers. The total number of berths served by this elevator will be fifteen. The total length of conveyor to be installed in connection with the elevator for loading ocean boats will be over 9,000 lineal feet.

The handling capacity will be: Receiving grain from boats, 18,000 bu. per hour. Receiving from cars, twenty cars per hour; shipping to vessels by means of conveyors, 80,000 bu. per hour; shipping to cars, forty-eight cars per hour. The elevator is designed so that a second moveable tower can be built at any time, with the effect of doubling the receiving capacity from



The Montreal Grain Elevator.

[*From the Scientific American.*

boats, or, in other words, raising it 36,000 bu. per hour. It is the intention to build this extra tower as soon as the business of the port demands it. The elevator, if working only one-third of the time during the navigation season of 150 days, would be capable of receiving and shipping more than 18,000,000 bu.

The whole building will be thoroughly lighted by incandescent electric lights. The elevator will have a complete dust collecting and burning system. It will also have an electric passenger elevator, washrooms and office for foreman, and all conveniences to make it complete. The cleaners installed in the elevator will be specially constructed of steel throughout, so as to be absolutely fireproof. All machinery in the elevator and conveyors will be driven by electric motors, and the total horse power represented by these motors, when the conveyor system is complete, will be about 2,500. The current will be furnished by one of the power companies doing business in Montreal. In the elevator will be a transformer station and switch room for controlling all the motors.

COAL MOVEMENT OF THE LAKES.

Editor Marine Review:—I find in the Marine Review of Mar. 19, 1903, page 23, under the heading "Coal Movement on the Lakes" a statement referring to the statistics issued by this bureau, as follows: "These figures are given simply for what they are worth, as it has several times been explained in these columns that the custom house figures are not all the time reliable."

I would call attention to the fact that the figures in question are not, properly speaking, custom house figures, the customs officials simply acting as the agents of the bureau of statistics for the receipt of supplementary manifests from masters of vessels. These manifests are made out either by the masters themselves, or by the marine clerks at the custom houses on the basis of statements made by the masters in person. It is believed that comparatively few of the vessels fail to be reported in this way, and that the totals are at least approximately correct. While it may occur in some cases that a larger amount is given than is later ascertained to have been received or shipped, it is also quite as probable that an under-estimation may occur in quite as many cases; consequently, these errors tend to balance one another, and the grand total would be a reasonably close figure of the total amount. In the case of iron ore shipments from the upper lakes, where railroads do not hesitate to give the quantity shipped, it has been found that the difference between the figures derived from supplementary manifests and those reported by the railroads at the ore shipping points, representing the quantity loaded on vessels, was only three-tenths of one per cent. The coal statistics are collected in precisely the same manner, and it is reasonable to regard them as equally accurate.

A further statement in the article referred to in your columns says: "The coal figures from the Washington bureau seem too high." On what grounds do you base your impression that the figure given is excessive? I should welcome any means of checking up these results because I believe that we have the right system in hand, though I am free to confess that there are defects to be eliminated by experience and familiarity with conditions.

O. P. AUSTIN,
Chief of Bureau.

Washington, D. C., Mar. 24, 1903.

[The efforts of the treasury bureau of statistics to compile complete reports of lake commerce are worthy of commendation and the reports are valuable, notwithstanding the question of reliability that is raised regarding all figures obtained through the offices of collectors of customs—a matter that has been discussed on several occasions in these columns. No doubt the system of supplemental manifests to which Mr. Austin refers has in many respects guarded against the shortcomings of the collectors' reports. But if we take as a point still in question the coal movement as reported by the bureau of statistics, there seems to be good reason for the opinion that the figures are too high. The treasury bureau gives 15,504,540 net tons as the total movement of coal throughout the lakes in 1902; reports from canal officials at Sault Ste. Marie show that in that year only 4,812,478 tons of coal went to Lake Superior. Again in 1901 the treasury bureau reports a total movement of 15,868,023 tons of coal throughout the lakes, while the canal figures show only 4,593,136 tons going to Lake Superior. Anyone acquainted with the coal trade of the lakes will certainly say that the reports of total movement are very much too high in view of the reliable summaries of actual shipments through the canals at the Sault.—Editor.]

CANADIAN SHIP YARD MATTERS.

It is not probable that the new Canadian Ship Building Co., Ltd., in which Mr. A. Angstrom, formerly with the Bertram Engine Works Co., is one of the leading spirits, will be in position to undertake contracts for some time to come, although the work of building the plant will be pushed along very rapidly. Offices of the company are in the Nordheimer building, York street, Toronto. The ship yard, which is now being laid out, will be located on the Canadian side of the Niagara river, 3½ miles below the International bridge, where the company secured about 120 acres, and the plant will be equipped for building the largest size lake passenger and freight vessels.

The United States & Dominion Steamship Co. is having built at Goderich, Ont., a passenger boat of 130 ft. length and 27 ft. beam for Georgian bay service. She will run between Owen Sound, Wiarton and local points as far west as Cockburn island. The vessel will be named Manitou and will be commanded by Capt. J. T. Baxter, a veteran Georgian bay navigator. She will have twenty-four staterooms and is expected to carry about eighty first-class passengers. Sixteen miles speed is looked for from this vessel. It is expected she will go into commission before the close of the present month. The United States & Dominion company's steamer C. W. Moore has already made a trip between Duluth and Grand Portage. She encountered no difficulty from the ice on the north shore.

It is understood that R. O. & A. B. MacKay of Hamilton, Ont., representing the New Ontario Steamship Co., Ltd., have ordered from Clyde builders a third steamer for the line of steel freighters which they are to establish between Fort William and Montreal. The first of these steamers, named Wahcondah, was launched recently from the works of Russell & Co., Port Glasgow, and it is expected she will be ready to sail for Montreal April 11. It is expected that a sistership will be delivered in September. The steamer for which an order has just been placed—third one—is to be 252 ft. long, 40 ft. beam and 24 ft. depth of hold.

The Bertrams, at Toronto, are building a full Welland canal sized steamer, to be named John Waldie. She is a duplicate of the Canadian steamer Iroquois.

CANADIAN SHIPPING NOTES.

The Merchants' Dispatch Line, now operating lines of steamers from Montreal to Toronto and Hamilton, and from Montreal to Cleveland, will add another line this season from Montreal to Port Arthur, calling at a number of intermediate ports. The Canadian steamers Advance and Glengarry have been purchased for the service, and a third steamer is being completed at Glasgow, Scotland, for the line.

In view of the increasing shipping business being done at Quebec, the dominion government will expend about $1,000,000 in adding to the accommodation there. Tenders are asked for the construction of a cribwork and concrete wharf, as the first installment of the work.

The Stanley Dollar Line, having its headquarters in Vancouver, B. C., has transferred all its vessels from the United States to the British register. The line comprises the sailing vessels Wyefield, Drumuir, Drumcray and Drumbarton, and the steamers Arab and Stanley Dollar.

The Dominion Coal Co. has just added to its coal carrying fleet the new steamer Dominion. The Dominion was built by Swan & Hunter, Newcastle-on-Tyne, Eng., and replaces the Mira, which ran ashore and was abandoned within a few months after she was built.

Considerable additional property on the Montreal water front has been acquired by the Canadian Pacific Ry., to provide accommodation for its steamboats.

British ship owners are endeavoring to dispose of a number of steamers of from 240 to 250 ft. in length. These are capable of going through the Welland canal, and if they were otherwise suitable, are just what are required on the lakes.

D. McNichol, general manager of the Canadian Pacific Ry., says that the company has no present intention of increasing its Pacific fleet, as it is capable of handling all the business offering.

F. Marshall, who managed the business of the Beaver Line at Liverpool, England, has been appointed European passenger manager for the Canadian Pacific Ry. Co.'s Atlantic steamers.

The Helen Glaiser is the latest edition to the steamers engaged in towing service at St. John, N. B. She was built by R. McDonald and engineered by the Flemings or St. John, N. B.

GREAT LAKES AND ST. LAWRENCE FLEET.

Supt. J. W. Norcross of the Great Lakes & St. Lawrence Transportation Co., Quebec, has appointed masters for the ten steel steamers building in lake yards for his company but assignments to the different steamers will not be made for several weeks. The captains are Alex. Craigie, John Duncanson, Ralph Gleason, Geo. McLeod, Daniel Murphy, W. D. Wait, Henry D. Pedersen, H. J. Hagan, W. A. Hodge and John Tower. Pilots are Robert Chestnut, Henry Chestnut, Frank Patenaude, L. Dussault and Onesime Hamelin. A tug to be used in the service of the company, the E. B. Eddy, will be commanded by Capt. Fred Mullin.

Improvements in Erie harbor to be made by the Buffalo Dredging Co., and upon which work is to begin immediately, include the construction of a concrete superstructure on the south pier and a sand catch jetty outside of the peninsula, also the dredging of the basin proper. The basin along the wharves, when the work is finished, will have a depth of 18 ft. The government appropriated $125,000 for these improvements and it is expected the work will be finished this season.

ASSOCIATION OF CANADIAN LAKE INTERESTS.

Toronto, April 1.—The deputation of shipping men which will wait on the dominion government at Ottawa, April 7, will be one of the most important that has discussed matters of interest to the inland mercantile marine with the authorities. While the deputation will be a large one and representative of the ship owners, and other allied interests, from all parts of the inland waters, it will not have the weight it should have if it went as representing the inland shipping interests in an organized form. The Lake Carriers' Association in the United States is an agency through which shipping men of the great lakes speak as a unit to the government at Washington, and not until the Canadian interests are similarly organized will there be any definite progress made in advancing the interests of Canadian ship owners on inland waters. There are questions to be considered in which Canadian and United States interests are somewhat antagonistic, and there are others in which they are as one, but under present circumstances it is impossible that the two sets of men can discuss them intelligently. The transatlantic shipping men are getting together and will have extensive power under their charter as the Shipping Federation of Canada, but while the inland men can be affiliated with that body for general purposes, they must organize as a distinct association for the advancement of the interests of the inland marine alone. The large additions being made to the fleet of steamers engaged in the Canadian trade on the great lakes is an indication of the growing importance of the trade and ought to suggest to ship owners and others that the time has arrived when the Canadian inland marine should have its own definite organization.

BARGE CANAL MEASURE PASSED.

New York's 1,000-ton barge canal project is now up to the people of the state. Bonds to the amount of $101,000,000 for canal improvement are authorized by the legislature, and if the people of the state at the coming November election approve of the measure just passed the work can be begun at once. No further legislation is needed. Strangely enough the 1,000-ton barge canal bill, which was introduced by the republican state administration, was in the end passed by the aid of democrats of the legislature. More than half of the republicans in both houses voted against the bill, while the democrats, evidently on the understanding, through Tammany, that it was wanted voted practically solid for it. But this is not the end of the struggle. The provision in the bill requiring its submission to popular vote still leaves room for doubt. The railroad influence, the efforts of those who favor a ship-canal built by the general government, and the hostility of the non-canal sections of the state which will be taxed for the construction and maintenance of the canal without apparent immediate benefits, will combine against the project.

CONDITION OF ICE ON THE LAKES.

Mr. Norman B. Conger, inspector and marine agent of the weather bureau at Detroit, announces that ice reports will now be discontinued for the season. In his latest bulletin he says that reports from the regular and display stations indicate that the ice fields have rapidly disappeared during the week and that the ice is confined to the harbors at Duluth-Superior, Chequamegon bay, St. Mary's river, northern Green bay, some fields at the straits and the extreme east portion of Lake Erie. The ice at Duluth averages 23 in., while in Chequamegon bay it ranges from 16 to 22 in. Whitefish bay is clear of ice. The ice is rapidly decreasing in St. Mary's river, and Hay lake is open below Six-Mile point. In the northern portion of Green bay the ice is breaking up and would move out with northerly winds. No trouble is anticipated in entering Escanaba harbor through the ice. A large field of broken ice is reported between Mackinaw and Waugoschance which boats can get through with some trouble. No ice is reported in Lake Huron or the rivers. In comparison with the same period last year the ice is thicker at Duluth and not so honeycombed; more ice in St. Mary's river and in the northern portion of Green bay, and the field at Mackinaw is larger than reported last season. In the other lakes the conditions are about the same. The display of storm warnings will be resumed on all lakes April 1.

AROUND THE GREAT LAKES.

Officials of both the Canadian and United States locks at the Sault announce that everything is in readiness for the passage of vessels.

The Federal Lloyds, to do general business in vessels and cargo insurance, has been organized at Chicago with F. H. Osborn as general manager.

Charles Moore, private secretary of the late senator James McMillan, has been appointed secretary to Francis H. Clergue at Sault Ste. Marie.

Life-saving stations on Lake Huron will open for the season on April 4. H. D. Ferris will be the keeper at Harbor Beach and Capt. Plough at Lake View station.

Official announcement of the appointment of L. G. Lewis as assistant passenger agent of the Detroit & Cleveland and Cleveland & Buffalo lines was made a few days ago.

It is now announced that both the North West and North Land will run between Buffalo and Duluth this season. There was some talk of one of them running to Chicago.

Charles B. Hopper has been appointed general freight agent of the Goodrich Transportation Co. to succeed F. C. Reynolds. Mr. Hopper has been with the Graham & Morton Line.

Ice is still very heavy at Fort William, north shore of Lake Superior, and it is not expected that vessels will be able to get in or out of that port until late in the present month, probably the 25th.

Capt. J. M. Mitchell has been named as the commander of the passenger steamer City of South Haven, launched at Toledo a few days ago. He was formerly in command of the steamer Petoskey.

Capt. James F. Trowell died at Milwaukee last week of general debility. He had sailed the lakes for a great many years but latterly had been harbor master at Milwaukee. He was seventy-five years old.

The lighthouse tender Marigold has finished placing the stakes in St. Mary's river. The gas buoy on the middle ground abreast of Sarnia is in position and masters are advised to keep close to the Canadian side at that point.

The Marine Firemen, Oilers & Water Tenders' Association of the lakes will hereafter have an office at Detroit. Michael Galvin of Buffalo has been assigned to this station and has opened headquarters at No. 50 Woodward avenue.

Patrick Garrity, for forty years keeper of the Presque Isle light, and an appointee of President Lincoln, died at his home at Alpena Tuesday night, aged seventy-five years. In point of service he was the oldest light keeper in the United States.

The following appointments of chief engineers have been made for the steamers of the Lehigh Valley line: Steamers Mauch Chunk, D. H. Fox; Seneca, Reynold Hills; Wilkes-Barre, H. Mellon; Saranac, H. M. King; E. P. Wilbur,, H. Wilson; Tuscarora, A. A. Brown.

As had been expected the men who were on strike at the Buffalo works of the American Ship Building Co. have returned to work. The men are working while the difficulties with their employers are being adjusted by an arbitration committee—anthracite coal strike method on a small scale.

Officers of the Monroe Transportation Co., which owns the freight steamer George L. Craig, just completed at the Toledo works of the Craig Ship Building Co., are: President, John Craig, Sr.; vice-president, John Adams; secretary, John Craig, Jr.; treasurer and manager, Thomas Adams of Detroit. Capt. D. Nicholson will sail the Craig.

John C. Fitzpatrick, well known in lake shipping circles, has just taken up at Duluth the duties of general agent for the Lake Michigan & Lake Superior Transportation Co. His territory will include St. Paul and Minneapolis. He succeeds John Flynn, who held a similar position for twenty-four years but who recently resigned to represent at Duluth the Great Lakes & St. Lawrence Transportation Co.

Capt. George P. McKay of the Lake Carriers' Association has received a letter from Capt. Winder of the gunboat Michigan asking definitely for instructions regarding the location of the magnetic ranges which the navy department, through the hydrographic office, has decided to establish in the Straits of Mackinac and in St. Mary's river. As soon as the weather opens the Michigan will make the necessary surveys for these ranges

George Bassett, master commissioner in admiralty at Toledo, has rendered an opinion in favor of the tug Roy in the libel cases resulting from an accident in a wreck off Grosse Point in Lake St. Clair, Oct. 20, 1895. The tug is owned by Sullivan, Breyner & Schenck of Toledo and while towing the Wilcox to Port Huron passed the steamer Phil D. Armour aground. The latter started working its wheel in the hope of being released by the swell, and the suction drew the Wilcox toward the Armour and in so doing she collided with the Ganges, also in tow, damaging the Wilcox to the extent of $400. Murphy of Detroit refused to pay the towing bill, claiming mismanagement on the part of the tug's crew. The Wilcox was libeled for the account and Murphy put in the counter libel for $400. The commissioner's finding is that the tug was not to blame for the accident, having kept a reasonable distance from the Armour.

Mr. Frank A. Jones of Alameda, Cal., who succeeds Mr. George Uhler as president of the Marine Engineers' Beneficial Association, was in Cleveland during the week and in company with Vice-President E. I. Jenkins met some of the officials of the Lake Carriers' Association. Wages of the marine engineers are, of course, already fixed by contract for this year, so that there was nothing to do on that score, but the officials of the two organizations talked informally of arrangements for conferences next winter. Aside from the advancement of Vice-President Jones to the presidency, there will be no change in national officers of the M. E. B. A. on account of the resignation of Mr. Uhler. Mr. Jones will probably divide his time for the balance of the year between Philadelphia and the lake region. Vice-President Jenkins has just concluded a settlement with officials of the Michigan Central Ry. regarding engineers on their three Detroit river car ferries. The chief engineers are to receive $130 a month hereafter and the seconds $117 a month and each is to have one day off in seven. An extra second engineer is to be employed so as to provide for the day off.

SUBSIDIES AND BRITISH SHIPPING.

By Lawrence Irwell.

The commission appointed by the British government to inquire into the subsidies paid to steamship companies and sailing vessels under non-British governments, and the result to British trade, has made its report, but little comment has appeared upon this side of the Atlantic, although the report itself has been printed in more than one journal. The commission cannot be said to have clearly defined the difference between a subsidy as a subvention for services rendered to the nation and a subsidy as a mere bounty to the recipient. A mail subsidy is obviously unlike a navigation subsidy. It cannot be a matter of serious importance whether the carriage of mails is somewhat more costly to one country than to another, always provided that the contract is given to the lowest bidder, only as a matter of freight, and not as a matter of favor. This is, of course, the free trade view, which is so strongly favored in England. British mail contracts would cost less if more ship owners competed for them, but the fact that few ship owners do compete for them proves that they are not particularly profitable and that the conditions are somewhat exacting. Regarded purely as contracts for conveyance of mails, however, British mail subventions are lower than those of this country or Germany. But the German mail subventions, although not subsidies in the common meaning of the term, are associated with indirect forms of bounty granted by the German government for the encouragement of foreign trade. These bounties take the form of exemption from customs dues on all material required for the construction, equipment, repair and provisioning of ocean-going ships, and of preferential rates over the railroads owned by the government. American mail payments practically include bounties, as far as the Atlantic service is concerned. There is a payment per trip of each mail steamer, irrespective of the amount of mail carried, and the mail matter is paid for at the rate of about $1.68 per pound for letters conveyed by American ships, while only about 35 cents per pound is paid for the same service by non-American vessels. The British commission realized, of course, that there is a possibility of the United States inaugurating the most complete system of subsidies ever undertaken by any nation. France, Russia and Italy subsidize their shipping for navigation and other postal purposes, but it cannot be said that the result has been specially beneficial to the shipping business. Sweden, Norway, Denmark and Belgium pay some small subventions, which are closely allied to bounties, but they are not of great importance, as these countries cannot be said to seriously compete with British shipping. Japan pays something like $4,000,000 a year in construction and navigation bounties.

No member of the English commission contended that foreign subsidies do not deprive British ship owners of some business which they might otherwise have obtained; and the report correctly asserts that the granting of shipping subsidies by foreign governments has "favored the development of competition against British ship owners and trade upon the principal routes of ocean communication." What right Great Britain has to expect to continue to do one-half of the total carrying trade of the world on all seas is not explained, although there is a distinct assertion that "notwithstanding the fostering effect of subsidies upon foreign competition, British steam shipping and trade have, in the main, held their own, and, under fair conditions, British ship owners are able to maintain the maritime commerce of the country." No definition is given of the words "fair conditions." The whole truth is that England has created more unfair conditions against her own shipping than foreign nations have produced by their bounties. They have been created by legislation, and however necessary they may be in the cause of humanity, they are unfair from a commercial point of view, because they are not imposed upon non-British ships which enter British ports. The committee recommended that "board of trade regulations should be enforced against foreign ships equally with British ships." To do this may be difficult—or impossible—until the legislature takes some action. That time is not far distant and American steamship companies would do well to keep that point in mind. A ship is a part of the country whose flag it flies and the commission has not explained how "all legislative restrictions applicable to British ships should be made applicable to all foreign ships coming to British or colonial ports and competing with British ships." Until parliament has carried out this idea, John Bull might perhaps act wisely in relaxing the legislative restrictions on his own ships. Although merchant shipping is the industry upon which British national life to an important extent depends yet it appears to be oppressed by legislation in a way that seems unreasonable to foreigners. For example' an individual who is not a British subject cannot own a British ship. But a corporation registered as British can own any number of such vessels although all the shares may be held by foreigners, provided there is a resident nominee to fulfil statutory requirements. Attention has been drawn to this anomoly in the criticism of the Cunard agreement which has appeared in the Marine Review.

The removal of legislative restrictions would probably compensate for American subsidies because wages are comparatively low on British steamers, and anybody who supposes that the establishment of the International Mercantile Marine Co. has dealt a death-blow to English shipping on the Atlantic is making a serious error. This opinion, however, is probably confined to a few daily newspapers. Foreign bounties do not oppress British steamship companies very seriously at present, and the commission reports "that the competition of British ship owners with their commercial rivals upon fair conditions, without government interference by way of subsidies, or by way of control of freights, is more healthy, and likely to be more beneficial to the nation and empire than a state-subsidised and state-controlled system, under which the ship owner would have to depend less upon his individual energy and skill and more upon the favor and support of the government." This seems to be incontestable, as is the fifth conclusion "that a general system of subsidies, other than for services rendered, is costly and inexpedient." Nevertheless, the commission directly recommends government interference when it asserts that "no subsidy should be granted without government control over maximum rates of freight," and over combinations between subsidized and unsubsidized owners. The answer to this is that no shipping company of first-class standing would accept a subvention for doing public service if government control and all its operations were to follow. It is true that in the Cunard agreement there is a stipulation that the company shall not "unduly raise freights," but there is no definition of the term "unduly," and, of course, the Cunard company cannot raise freights above a competitive level, or it would lose business. The Cunard agreement is not likely to benefit either the nation or the company. It is an injudicious attempt to give a stimulus to an unremunerative class of shipping with an outlay of public money. The commission, however, expressed itself in favor of maintaining the pre-eminence of British lines, and of a condition of "adequate speed" forming part of every subsidy to ensure rapid communication within the empire, to secure fast carriers of food supplies in time of war, and to meet admiralty requirements. But all these things can be secured without government bounties to individual enterprises, and without government interference.

Two clauses in the commission's report relate to nationality. It is recommended that no British subsidy be granted, except on the condition that neither sale nor hire of any subsidized ship should take place without the permission of the government. And it proposed as desirable that the majority of the boards of directors of subsidized companies should be British subjects, and that subsidized vessels should be entirely officered and proportionately manned by British subjects. Nobody—at least no American—will deny the reasonableness of these proposals.

A majority of directors of British subsidized steamship companies ought, of course, to be British subjects, but this would be of little avail if the shares were held by non-Britishers whose votes would control the management. There is no reason in law, nor in equity, why corporations should have privileges which are denied to individuals. The Morgan combine would not have taken place had the transfer of shares in the British companies to Americans necessitated the removal of the ships from the British register. As the vessels were built outside the United States, American registration was not open to them.

The commission advises that "means should be taken for establishing reciprocal arrangements in respect of the coasting trade of the several maritime countries." The suggestion is that not only the coasting trade of the British isles, but the whole inter-imperial trade should be forbidden to the vessels of those countries which persist in reserving their own coasting trades for their own vessels. This proposal will be popular, and there is a great deal of plausibility about it. But the wisdom of it is open to question. British ships no doubt lose some employment by the reservation of the trade from the Atlantic to the Pacific states of this country to American vessels. They have, however, no right to expect such trade, because it is strictly American. They lose some Russian trade between Russian ports on the Black sea and the Baltic, and between Russia and Siberia. They also lose some of the trade between France and Algeria to French vessels, and between Holland and India to Dutch vessels. To complain of this would be absurd. The numerous foreign banks doing business in New York city do not complain because they are forbidden to receive deposits from the public. The shipping business from which English ships are excluded is business which belongs rightfully to some other nation; it is not, in reality, international business at all. And there is another point. If the business referred to were thrown open to the world, the ships at present exclusively engaged in it would soon enter into competition with British ships elsewhere. So long as English ship owners were carefully protected in the coasting and colonial trades, they did very little to improve their vessels or to develop external trade. It was in those days of British restrictions that the United States obtained the mastery of the transatlantic trade which, sad to relate, has since been lost. What happened before might easily happen again. If Great Britain closes her own coasting trade and the trade between the several members of the empire against foreign ships, the British empire would be placed within a protective freight fence, and all the carrying trade between foreign nations would be forced into the hands of foreign vessels. John Bull would be the loser if this plan were carried out.

HYACINTH HAD ALL THE BEST OF IT.

Last week the Review published an article showing that it was no fault of the Belleville boilers that the Hyacinth in the race with the Minerva (British cruisers) was forced to abandon the contest. Further particulars of the speed trial are now at hand. It appears, indeed, that the Hyacinth had all the best of it and would have undoubtedly won had the rest of the machinery worked in unison. The race was from Gibraltar to Portsmouth, a distance of 1,150 miles. A few hours after starting the Hyacynth was ahead of the Minerva and increased her lead hourly as the day advanced. The engines of both cruisers were working satisfactorily, and the engineers on the Hyacinth were particularly well satisfied with the boilers, the leakage being very slight. All the eighteen Belleville boilers were being worked at the utmost pressure, the horse power being about 12,000; whilst on the Minerva the eight single-ended boilers were being subjected to a great pressure, the horse power being about 9,000. During Sunday the Hyacinth averaged a little under 21 knots per hour, while the Minerva's speed was fully a knot less. Before daybreak on Monday the Hyacinth was about 50 miles ahead of her sister ship, and the engines were still giving satisfaction. But shortly afterwards signs of overheating were found in the crank-heads of some of the cylinders of the port engine. Oil was emptied on to the heated bearings in large quantities, and as this did not appreciably diminish the heating, hoses were turned on, and gallons of water were poured on the crank-heads; and it was only when it was positively dangerous that at 8:45 on Monday morning the chief engineer ordered the port engine to be eased down. The metal packing was found to have commenced melting, and there is no doubt the consequences would have been serious if the engine had not been slowed. It was then decided to stop the engine altogether, and mechanics were set to work on the defective bearings. The ship was now entering the Bay of Biscay, and as she was not making much more than 6 knots per hour with only her starboard engine working, the choppy weather made her roll and pitch considerably. During the morning the Minerva caught up with the Hyacinth, and the accident was signalled. However, the Minerva continued on her course, as it had been decided that should one of the ships break down the other should complete the voyage. At a slow rate of speed the Hyacinth crossed the turbulent waters of the bay during the Monday and Tuesday, the Minerva being lost sight of towards Monday evening. Soon after entering the channel the broken-down cruiser got into communication with Rame Head by wireless telegraphy, and received her orders. At 9 o'clock the working party had readjusted the bearings, and the port engine was again set in motion. The cruiser proceeded to Plymouth at a speed of about 10 knots, arriving on Wednesday afternoon, while the Minerva arrived at Spithead early on Tuesday morning. As soon as the race was abandoned the Minerva dropped to 18 knots, and passed St. Catherine's 62 hours, less 2 minutes, after she left Gibraltar.

STATISTICAL ABSTRACT OF THE WORLD.

"Statistical Abstract of the World" is the title of a publication under preparation by the treasury bureau of statistics, the first section of which will be published in the forthcoming issue of the monthly summary of commerce and finance. The work when completed will be, as the title implies, an abstract or summarization of the national statistics of the world, including area, population, imports, exports, revenue, expenditures, debts, money in circulation, principal productions, the sources from which imports are drawn and the countries to which exports are distributed. The first section, which is to make its appearance in the next issue of the monthly summary, shows the total imports and total exports of every country of the world for which statistical statements can be obtained, extending back to the earliest period for which data are available. It also includes statements of the area, population, revenue, expenditure, debt, interest charge, currency and stocks of money of each of the principal countries of the world at the present time. These statements are reduced to United States standards of currency, weights and measurement, and are therefore easily available both for the actual information which they contain regarding the commerce of each country and for comparison of country with country in regard to the import and export trade. Most of the tables showing imports and exports extend back as far as 1870, and in many cases much earlier; that of France beginning with the year 1815, the United Kingdom 1801, and the United States with the year 1790.

These tables show that the total international commerce of the world now aggregates about $21,000,000,000, of which about $10,000,000,000 is exports and $11,000,000,000 imports. The fact that all exports eventually become imports and that all imports must have been originally exports suggests that the value of the world's imports should not materially differ from the figures of exports, but the fact that the cost of transportation and other charges are in many cases added to the value of the export when it is measured as an import explains, in part at least, the fact that the aggregate figures of national imports exceed those of exports.

A study of these tables presenting the imports and exports of the principal countries shows that the United States was in 1902 the largest exporter of domestic merchandise, while in 1870 her exports were exceeded by three countries—France, Germany and the United Kingdom. In "favorable balance of trade," or excess of exports over imports, the United States also holds first rank among the nations, her excess of exports over imports being not only greater than that of any other country, but actually more, in 1901, than the total excess of exports over imports of all other countries whose exports exceed imports.

The following tables show the total imports and total exports of merchandise of twenty of the principal countries of the world in 1870, 1880, 1890 and 1901. The export figures are those of domestic produce only, the import figures those of articles intended for use in the country of importation and not for re-exportation:

IMPORTS INTO TWENTY PRINCIPAL COUNTRIES IN ORDER OF MAGNITUDE IN 1901.

Countries.	1870	1880	1890	1901
		(Millions of dollars.)		
United Kingdom	1259.2	1692.9	1732.3	2210.1
Germany	A775.1	670.9	986.6	1290.2
France	553.4	971.4	856.3	843.2
United States	435.9	667.9	789.3	823.1
Netherlands	187.2	332.8	519.9	818.3
Belgium	177.7	324.4	322.7	428.6
British Australasia*	127.8	205.6	309.4	359.6
Italy	172.6	228.9	254.6	331.5
Austria-Hungary	210.1	249.6	244.2	325.4
Russia	201.5	309.6	232.8	B322.7
India	160.2	166.7	231.8	262.4
Spain	100.7	137.4	181.6	182.7
China	100.7	108.1	161.8	190.8
Straits Settlements	48.5	66.3	119.4	144.7
Japan	34.7	32.7	71.4	127.3
Argentina	47.4	43.9	137.2	B109.5
Cape of Good Hope	11.4	37.2	45.5	104.2
Brazil	69.3	75.6	115.8	96.1
Dutch East Indies	48.8	69.7	64.3	92.1
Mexico	20.1	no data	52.0	62.4

EXPORTS FROM TWENTY PRINCIPAL COUNTRIES IN ORDER OF MAGNITUDE IN 1901.

Countries,	1870	1880	1890	1901
		(Millions of dollars)		
United States	376.6	823.9	845.2	1460.4
United Kingdom	971.2	1085.5	1282.4	1362.6
Germany	A551.6	688.5	791.7	1054.6
France	540.8	669.3	724.4	774.4
Netherlands	153.5	251.1	434.8	695.7
Austria-Hungary	192.4	275.1	308.5	382.7
Russia	215.9	247.9	388.0	B369.1
Belgium	133.1	234.8	277.3	352.8
India	255.3	272.2	346.5	349.4
British Australasia*	94.0	203.5	269.0	323.0
Italy	145.7	212.9	172.5	264.4
Brazil	89.2	97.2	141.5	197.6
Spain	77.1	125.4	180.9	152.5
Argentina	29.1	56.3	97.2	B149.1
Japan	14.9	25.3	49.4	125.6
China	87.4	106.2	110.9	120.6
Straits Settlements	42.3	66.0	103.7	124.3
Dutch East Indies	D85.8	70.2	70.9	102.6
Cape of Good Hope	12.5	37.5	40.8	45.7
Mexico	no data	26.0	18.1	33.0

*Includes intercolonial trade, which forms about one-half of total; A, 1872; B, 1900; C, 1872; D, 1876.

FOR ELECTRICAL INSTRUCTION AT SANDY HOOK.

As an aid in the instruction of officers of the army in electricity and electrical apparatus, the government has recently ordered from the Westinghouse Electric & Mfg. Co., for use at the Sandy Hook proving ground, a 30-kilowatt, A. C., composite wound, belt-driven generator, delivering two-phase current at 220 volts, and 7,200 alternations, running at 1,200 R. P. M.; one 1½-kilowatt, D. C., compound-wound, multipolar exciter of 125 volts and 1,300 R. P. M.; and a 1-H. P., single-phase, A. C., type "C" motor of 200 volts, 7,200 alternations and running at 1,600 R. P. M., together with starting rheostat and other auxiliary apparatus. There is also being supplied a 10-kilowatt rotary converter, 2 and 3 phase, 220 volts, A. C., 7,200 alternations and 1,800 R. P. M. This rotary converter is provided with an extended shaft for operation as an A. C. and as a D. C. generator, together with two auto-transformers which provide for the raising of the A. C. voltage from 175 to 220 volts when the rotary converter is operated from the D. C. side; and a D. C., 125-volt, compound-wound multipolar exciter of ¾ kilowatts capacity. Added to the above are four 7½-kilowatt, O. D. transformers, 2,200 volts primary and 220 volts secondary, arranged for scrap 3-phase 2-phase transformation, enabling them to operate on 2-phase or 3-phase. This installation with complete switchboard and detail parts was recently accepted by Capt. Dunn, U. S. A.

Lime-Kiln crossing lightships and the Bar point lightship, lower Detroit river, are in position.

IMPROVEMENTS IN LIVING IN THE NAVY.

In order to make the American sailors' lives as happy as is possible under the rules of the navy department, and with a view to eliminate causes of desertion, the secretary of the navy, a little over a year ago, ordered an addition to their rations and the preparation of their food by regulation cooks, that the meals be served in a more appetizing manner. This innovation has been in force a little over a year now, and, according to the navy department authorities, has borne good fruit. There is more contentment among the men. The navy department, by its last change, so added to Jackie's ration that his meal actually has a present money value of 30 cents. By these additions the navy department authorities expect to build up a lot of seafaring men as sturdy and as enduring as the Norsemen. The men are still allowed to commute one-fourth of the rations, a pleasing variety capable of maintaining the health and well-being of the men in any climate.

Jackie is now wholly subsisted at the government's expense, and no contributions are allowed out of the men's pockets, even on high days and holidays. For these occasions turkey, fowl and fresh meats are bought through the government allowance, and this saves much of the gorging that heretofore has generally caused an enlarged sick list and a heavy run on the ship's stock of paregoric, ginger and the like, for Jackie, after all, is often only a child of larger growth. Milk, condensed generally, forms a part of the new ration, and hardtack is issued but once a week, while canned roast beef and mutton, not relished by the enlisted force, had to give way to appetizing ham or shoulder, tinned bacon and canned salmon. Sauerkraut and pickles are on the bill of fare. An emergency ration is supplied for landing parties and for use in the drills "abandon ship" and "arm and away."

By the new regulation cooks are paid by Uncle Sam, and the mess attendants, heretofore dubbed "berth deck cooks," likewise are furnished and subsisted entirely at the government's expense, while extra issues of utensils are made from time to time to meet the reasonable wear and tear of the reorganized cuisine. There is a chief commissary steward on each ship, whose function it is to manage entirely the culinary department. His principal assistant is the commissary steward, and under the latter come the various grades of cooks and bakers, these being the men who see that Jackie has his soft bread when the ship is many days at sea and leagues upon leagues away from shore supplies. All of these cooks are fully qualified, not the makeshifts of the old system, and there is no reason why the food should not only be well and appetizingly cooked, but just as attractively served. The commissary stores, apart from the service ration features, are now bought through subscription on the part of the enlisted men concerned. The first profits of these stores repay the subscribers and the extra profits are used to increase the stock in hand. At the end of a commission the assests of these stores are equally distributed among the members of the general mess. This, in effect, is something like an exchange on each ship, and permits Jackie to add to his fare at a modest outlay. The ship's company is no longer divided into a number of separate messes of twenty persons each, with independent managements. They are still grouped in bodies of about twenty, but the ship's company constitutes one general or consolidated mess, and all are fed alike.

Forty years ago the government made the last substantial change in the ration of the enlisted force of the navy, and from that day to last year, with the single exception of the acts of 1872 and 1880—the first providing an additional ration of tea or coffee and sugar to each seaman on first turning out in the small hours of the morning, and the second providing or permitting the substitution of "desiccated tomatoes" for dried potatoes—Jackie has been fed substantially upon a diet years behind the times. It is true the regulations showed certain variations of the prescribed ration set by the act of July 18, 1861; but there is a long difference between a bill of fare and the served dish, as we have all learned in even the best of restaurants at times, and Jackie's cook seldom if ever professes to qualifications a bit in advance of those demanded by the very cheapest of boarding houses. There was a deplorable loss due to wasteful method or lack of method in preparation, and there was a much sadder loss caused by the uninviting way of serving. The names that Jackie has given to so many of his sea dishes told more than anything else the color of the mental glasses through which he viewed them, and the skill in their preparing—if the term apply at all—had remained pretty much the same hit and miss fashion for the last three-quarters of a century, with some modest exceptions. The term ration means the one daily issue of food for the individual, an allowance, since 1870, having a commutative value of 30 cents, and intended to supply the call for three weeks. In March of 1794 congress provided that the ration per diem and for each day of the week should be as follows:

Sunday—One pound of bread, one and one-half pounds of beef and one-half pint of rice.

Monday—One pound of bread, one pound of pork, half pint of peas and beans and four ounces of cheese.

Tuesday—One pound of bread, one and one-half pounds of beef, one pound of potatoes or turnips and pudding.

Wednesday—One pound of bread, two ounces of butter or six ounces of molasses, four ounces of cheese and half pint of rice.

Thursday—One pound of bread, one pound of pork and half pint of peas or beans.

Friday—One pound of bread, one pound of salt fish, two ounces of butter or one gill of oil, and one pound of potatoes.

Saturday—One pound of bread, one pound of pork, half pint of peas or beans and four ounces of chesse.

And there are also allowed half a pint of distilled spirits a day, or, in lieu thereof, one quart of beer to each ration.

In 1801, upon the reduction of the navy, flour, suet and vinegar made their appearance in the ration, and it was forty years before another change was made. By that act, however, tea, coffee, cocoa, sugar, pickles and cranberries were allowed, while the spirit ration was cut down to one gill, and substitution of fresh vegetables and fresh meat was authorized, and raisins, which made plum duff possible, came into the bill of fare. At this time the commutative value of the entire ration, that is, the three meals per diem, was 20 cents. Viewed in the light of modern conditions and realizing the stress and toil incident to the navies of the forties, it is hard to understand how the men were kept fit for work. In fact, the records of the service show that they frequently were not equal to their tasks, and the stories of the sailors' dread, scurvy, are frequent, especially during the hardships of blockading the Mexican ports during the war with that country.

In the early fifties, realizing the hazard of continuing thus, the department was authorized to have made a scientific examination of the preserved meats, but the stress of war a few years later practically nullified whatever helpful conclusion were reached, and provisions had to be bought and accepted with a goodly margin of doubt in many cases.

In 1861 congress authorized the ration in force up to last year, a distinct advance upon anything provided prior to that date, and departmental authorization permitting commutation of two rations in every mess of fourteen, and subsequently five rations in a mess of twenty, made it possible to go outside in the open market and buy things not within the lawful scope of the governmental ration. In 1862 congress abolished the spirit ration, all, as the sailor puts it:

"They've raised my pay 5 cents a day,
But stopped my grog forever."

Congress, in 1861, put a daily limit of food upon the ration, and in 1870 it established the commutative value of the ration at 30 cents—that really represented the money value of the food then supplied by Uncle Sam to the enlisted men each day. Since then, however, those items of diet have generally cheapened—in fact, 18 cents about represents their present value. If the men could go into the open market after having commuted their entire ration, they could buy 12 cents' worth more food than now allowed by the ration, pure and simple, prescribed forty years ago by congress; and even were the men to commute only the quarter of the ration, as now allowed, they could save 3 cents a man and still have the full ration for the entire mess by buying the difference from the ship's stores at current prices. Or, by sending the full one-quarter commutation of a mess of twenty men at the ship's stores, all of the men would enjoy the full ration plus 3 cents' worth more of food.

Thus, it is plain that the food value of the ration increases in direct ratio to the number of ship's rations that are commuted, because the money value is greater than the food value set by congress years ago.

USE OF ELECTRICITY ON GERMAN VESSELS.

Ernest L. Harris, United States commercial agent at Ebenstock, Germany, contributes to the state department at Washington a brief article upon the use of electricity on German vessels. He says:

"The incomparable development of the German ship building industry during the past twenty years has called forth all the ingenuity of the technical engineer. That Germany today possesses the fastest vessels which cross the Atlantic is a triumph due chiefly to the skill of the trained machinist. In no merchant marine is electricity used in connection with all the latest inventions to a greater extent than on German vessels. Its application to the comfort and safety of ocean travel presents one of the brightest chapters in the history of modern ship building. The Kronprinz Wilhelm, the latest express steamer afloat, furnishes the best example of the use of electricity at sea. All the cabins have not only electric lights and call bells, but are fitted up with telephones as well. The first-class cabins on the promenade deck and the dining room are heated by 104 electric ovens. Electricity is applied to forty small and nineteen large motors, as well as to many cranes and ventilators. The power of the motors from which the electricity is derived for lighting and other purposes is engendered by four independent dynamos. Connected with the dynamos are four compound steam engines. Three dynamos are situated behind the engine room between the two huge propelling screws. They are protected by watertight bulkheads and are separated from the engine room and piston rod by solid partition doors. The fourth dynamo is located in a large niche in the engine room, above the water line, and on a level with the main deck.

"An interesting feature of the application of electricity on shipboard is the so-called Schotten telegraph, or bulkhead tele-

graphy. In the moment of danger caused by a collision, this telegraph enables the captain on the bridge to see whether all the watertight doors are closed or not. On board the Kronprinz Wilhelm, there are forty such doors, twenty-one of which are electric trap contrivances, which fall into place at a moment's notice. There is a watertight apparatus joined to each one of these doors which is connected by wire with a tableau on the commanding bridge. This tableau shows the captain a complete plan of all the decks, and every time a trap door falls into place he is apprised of the fact by the lighting of an electric lamp. In case of danger, the ship's crew receives the alarm by means of thirty-six electric bells, which are distributed throughout the vessel. These bells are divided into two electric current circles. The twelve bells of the first division are located in the boiler, machine, dynamo and steerage rooms—that is, in every place where a watertight trap door is situated. The twenty-four bells of the second division are located throughout the entire ship and serve to summon the whole crew when necessary. The alarm apparatus is fed with 100 volts directly from the engine room. The whole outfit was constructed especially for the Kronprinz Wilhelm, and is entirely water proof in every respect. The fire-alarm signals are similar to those above described. The moment a fire breaks out it is exactly located on the chart in the pilot room by means of an electric lamp. There are thirteen electric fire alarms distributed throughout the ship. The entire electric outfit on board the Kronprinz Wilhelm was put in by the Union Elektricitats Gesellschaft in Berlin. It took seventy men six months to complete the work.

TRADE NOTES.

Pawling & Harnischfeger, crane and hoist builders, Milwaukee, Wis., expect to move from their present location on Clinton and South Water streets, to a new site, just purchased, on National and 38th avenues, covering 19½ acres.

The American Steam Gauge & Valve Mfg. Co., Boston, manufacturers of gauges, valves, indicators, reducing wheels, revolution counters, clocks, whistles, etc., was recently reincorporated under the laws of New Jersey, with capital of $250,000. The company has under consideration, and expects to have completed in the early fall, a new factory where they can double their present output.

The Truscott Boat Mfg. Co., St. Joseph, Mich., has a very creditable display of launches at the Sportsmens' show in Cleveland. It is one of the most attractive exhibits at the show and there is a constant crowd about it. One of the launches shown is a light-power tender, probably one of the lightest made. It is a thoroughly reliable craft, 12 ft. long, 4 ft. 4 in. wide. It will carry five persons safely and is designed for a speed of 6½ miles.

The Buffalo Forge Co. announces the removal of its Pittsburg offices from 516 Fitzsimmons building to 607 House building, corner Smithfield and Water streets. The new offices afford the large increase in space demanded by the steady growth of the Buffalo company's business in the Pittsburg section. They are being euipped fully in keeping with the high standard of the building. As heretofore, the Pittsburg district sales will be in charge of Mr. H. D. Wilson, M. E.

An event of great importance in the maritime world will be the launching this month of one of the enormous twin-screw, steel steamships being constructed by the Eastern Ship Building Co., New London, Conn., for the Great Northern Steamship Co. The entire surface of the exterior of the hull of this vessel has a priming coat of Dixon's silica-graphite paint. Advantages of this paint have won the approbation and endorsement of prominent naval architects and engineers who have investigated its merits.

"Perfection in Transformer Insulation" is the title of a little pamphlet issued by the Fort Wayne Electric Works, Fort Wayne, Ind. The importance of perfect insulation in transformer construction is often overlooked in the effort to obtain high operating efficiency. In transformer design economy in use of space allotted to the windings results in increased efficiency. At the same time it is necessary to provide thorough insulation between turns and layers of conductors and between coils and core to insure proper operation under all conditions. The pamphlet shows how perfect insulation is secured. It is well printed and will be sent to anyone upon request.

The Toledo Furnace Co., controlled by Pickands, Mather & Co. of Cleveland, is building at Toledo a furnace which is expected to go into blast in May. It will have a daily capacity of 350 tons of pig iron. The engine house, with its blowing engines, has been designed upon a scale to provide for expansion, and it is reported, and not denied, that the company contemplates the erection of another furnace, though not immediately. The strategic importance of Toledo is being recognized by other Cleveland companies, the Cleveland-Cliffs Iron Co. having already secured considerable water frontage there.

A remarkable machine has been installed in the Washington navy yard for the purpose of finishing the surfaces of the propellors used in the tank in which models of warships are tested. This ponderous machine weighs 10 tons, while some of the propellors on which it operates weigh only 2 lbs. each, their diameters varying from 5 in. to 2 ft. Although designed especially for planing helicoidal surfaces, there is a provision for planing irregular surfaces by means of cam wheel attachments.

BELLEVILLE WATER-TUBE BOILERS

NOW IN USE (FEBRUARY, 1903)

On Board Sea-going Vessels, NOT INCLUDING New Installations Building or Erecting.

French Navy	276,460	H. P.
English Royal Navy	84[illegible],300	"
Russian Imperial Navy	193,900	"
Japanese Imperial Navy	122,700	"
Austrian Imperial Navy	32,900	"
Italian Royal Navy	13,500	"
Chilian Navy	26,500	"
Argentine Navy	13,000	"
The "Messageries Maritimes" Company	87,600	"
Chemins de fer de l'Ouest: (The French Western Railway Co.) Steamships plying between Dieppe and Newhaven	18,500	"
Total Horse Power of Boilers in Use	1,634,360	

WORKS: Ateliers et Chantiers de l'Ermitage, at Saint-Denis (Seine), France.

TELEGRAPHIC ADDRESS: Belleville, Saint-Denis-Sur-Seine.

BIDS SOLICITED FOR THREE 16,000-TON BATTLESHIPS.

The navy department is advertising for bids for the construction of three battleships of the Vermont class recently authorized in the naval act. The bids are to be opened on June 3. The vessels are to be of 16,000 tons displacement and to have a sea speed of 18 knots. The general dimensions of the vessels, as given in the circular defining their characteristics, are: Length on load waterline, 450 ft.; breadth, extreme, at load waterline, 76 ft. 10 in.; mean draught to bottom of keel at trial displacement, 24 ft. 6 in.; gross draught, full load, about 26 ft. 9 in.; total coal bunker capacity, about 2,200 tons; coal carried on trial, 900 tons; feed water carried on trial, 66 tons. The main battery is to consist of four 12-in. guns,, eight 8-in. guns and twelve 7-in. guns. The secondary battery consists of twenty 3-in., 14-pounder rapid-fire guns, twelve 3-pounder semi-automatic guns, six 1-pounder automatic guns, two 1-pounder semi-automatic guns, two 3-in. field pieces, two machines of 30 caliber, and six automatic guns of 30 caliber. The 12-in. guns will be mounted in pairs in two electrically-controlled, balanced, elliptical turrets, on the center line, one forward and one aft, each with an arc of fire of about 270°. The 8-in. guns are to be mounted in pairs, in four electrically-controlled, balanced, elliptical turrets, two on eac.. beam, at each end of the superstructure. The 7-in. guns are to be mounted in broadside on pedestal mounts on the gun deck behind 7-in. armor, each gun being isolated by splinter bulkheads of nickel steel of from 1½ to 2 in. thick, forward and after guns arranged to fire right ahead and right astern respectively and the other 7-in. guns to have the usual broadside train. All the 7-in. guns are so arranged that their muzzles train inside the line of the side armor, thus leaving a clear and unobstructed side when it is desired to go alongside a pier or vessel.

The hull will be protected at the waterline by a complete belt of armor 9 ft. 3 in. wide, having a uniform thickness of 9 in. for about 285 ft. amidships, forward and aft of which points the thickness is gradually decreased to 4 in. at the stem and stern. The lower casement armor extends to the limits of the magazine spaces and reaches from the top of the waterline belt to the lower edges of the 7-in. gun ports on the main deck, and is 7 in. in thickness, the athwartship bulkheads at the end of this casement being 6 in. thick. The casement armor around the 7-in. guns on the gun deck is 7 in. thick, and the splinter bulkheads are from 1½ to two in. thick. The protection of 3-in. guns is nickel steel 2 in. thick. The upper casemate athwartship armor, extending from the shell plating to the 12-in. barbettes, is to be 7 in. thick throughout. The 12-in. barbettes extend from the protective deck to about 4 ft. above the main deck and consist of 10 in. of armor in front and 7½ in. in the rear above the gun deck. Between the gun deck and protective deck there will be a uniform thickness of 6 in. The barbettes will not have any special framing, the connection of the armor to the decks being sufficient. The 12-in. turrets will have a front plate of 12 in. thickness, rear plates 8 in. thick and top plates 2½ in. thick. The 8-in. barbettes will be 6 in. thick in front and 4 in. thick in rear with the upper tube 3¾ in. thick and the lower tube 3 in. thick. The 8-in turret front plate will be 6½ in. thick, the rear plates 6 in. and the top plates 2 in. thick. The conning tower and shield will each be 9 in. thick.

The engines will be of the vertical, twin-screw, four-cylinder triple-expansion type of a combined horse power of 16,500. Steam will be supplied by twelve water-tube boilers, placed in six watertight compartments.

Each battleship is to carry forty-two officers and 813 men.

It is reported in New York that considerable feeling has developed among a certain class in the Steel Corporation because in merging the American Steel Hoop Co., the National Steel Co. and the Carnegie Co. the name Carnegie was dropped altogether. The articles of merger gave the name National Steel Co. to the three corporations. It is stated that Mr. Carnegie himself sent a personal note of protest. At anv rate the articles were amended and the name Carnegie substituted for National. The merger is, of course, purely of convenience and does away with the necessity of maintaining organizations for each company. Moreover about $7,000 is saved in fees paid to the state of New Jersey, as the capitalization of the combined companies is $63,000,000 as against $252,000,000 for the separate companies. It is probably the intention of the Steel Corporation to gradually eliminate the individuality of the underlying companies and become an operating company, instead of, as now, a stockholding company merely. The report that President Charles M. Schwab had gone to Pittsburg to inspect and appraise the plant of the Jones & Laughlins Co. carried its own refutation by the fact that all the leading interests of the company were in New York at the time.

A dispatch from Indianapolis announces that a contract has been signed between the Indiana harbor syndicate and the trunk lines running through Hammond from Chicago, by which a canal will be built at once from Indiana harbor 3½ miles south to the Calumet river, the canal to be 21 ft. deep, 300 ft. wide at the mouth and 250 ft. wide elsewhere. It will cost $700,000. The syndicate is composed of McCormack and Palmer interests and C. W. Hotchkiss, F. R. Babcock, Frederick S. Winston, Albert D. Erskine, Oakleigh Thorne, John A. Spoore, Owen Alder, Jarvis Hunt and Richard Fitzgerald, all of Chicago. The syndicate has also incorporated the Indiana Harbor Railroad Co. to connect the harbor with the coal fields of Indiana in the vicinity of Terre Haute. A steamship line is also projected. Work has already begun upon the Indiana harbor projects.

At the yard of the Union Iron Works, San Francisco, the steel tank steamer Whittier has been launched. The vessel is owned by the Union Oil Co. and is the third of a fleet of oil carriers which is owned by the company on the Pacific coast. The steamer is 250 ft. long, 41 ft. beam and 16 ft. deep. She will ply in the oil trade on the Pacific coast.

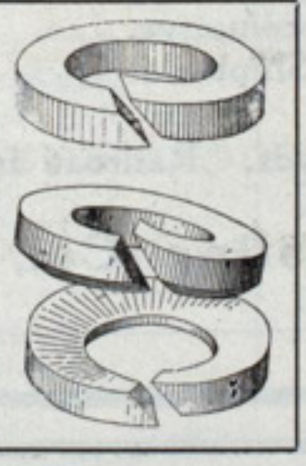
The Inland Marine Construction Co., Marietta, O., has secured a contract for a steamer 210 ft. long, 32 ft. beam and 5 ft. deep for service on the Ohio river. She will, when completed, cost about $45,000.

The Lakeside Steamship Co. of Duluth has purchased the steamer Alfred Mitchell from Langell Sons Co. of St. Clair. The Mitchell is a wooden steamer of 1,751 tons gross.

Hull Draughtsman Wanted.

Wanted—Experienced hull draughtsman for government work. Apply to chief draughtsman, Bath, Iron Works, Bath, Me. April 2.

"VULCABESTON"
CONCAVE and CONVEX
PACKING RINGS



Used by representative power stations and steam plants for the Piston Rod, Reciprocating and Corliss Valve Stem and Throttle Stem Packing on stationary engines. Will not score the rod. Readily conform to any uneveness in the rod and greatly reduce friction.

Made in pairs Concave and Convex split diagonally opened laterally and sprung over the rod. This formation tends to press the Convex Rings closely to the rod and the Concave Rings to the box, preventing leakage of steam at either side. Practically indestructible. Will pack satisfactorily against high pressure or superheated steam, and work perfectly in vacuum.

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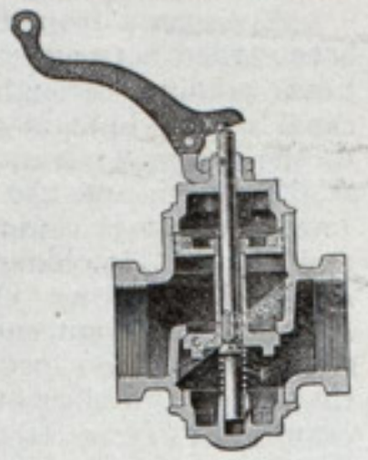
United Marine Mfg. & Supply Co.,
MANUFACTURERS OF AND DEALERS IN
ELECTRICAL MATERIAL
FOR SHIPS AND FORTIFICATIONS.
ALBERT C. JAHL, General Manager,
100 William St., New York, U. S. A.

AUTOMATIC BALANCED WHISTLE VALVE.

The form of whistle valve illustrated herewith is made by the Lunkenheimer Co., Cincinnati. They say of it:

"Under high steam pressures it is very difficult to operate the ordinary whistle valves and to keep them tight. The disc is not balanced, and, as they close with the steam pressure, the continual pounding on the seat soon causes them to become leaky and troublesome. This new automatic balanced whistle valve can be operated very easily under the highest steam pressures and can be kept tight without difficulty. In this valve the disc is balanced at all times, and when the valve is closing it does not hammer on the valve seat but closes firmly and without any shock or jar. In opening, the steam pressure acts upon the valve disc in such a manner that the disc is raised from its seat almost automatically.

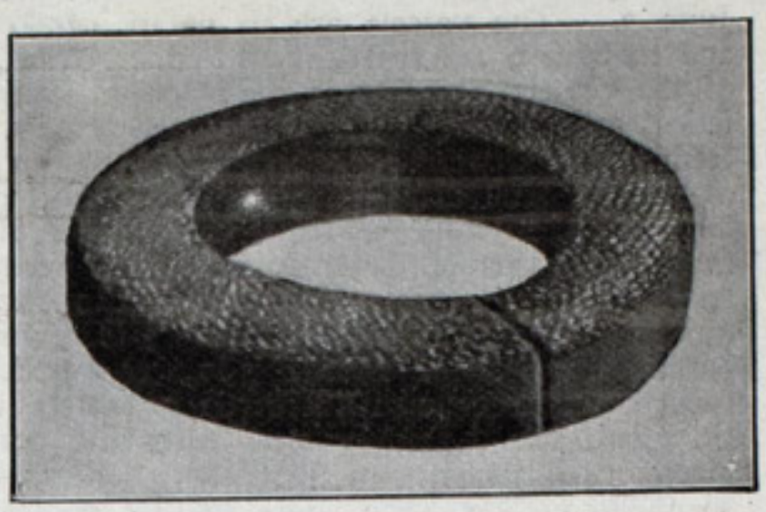


"Reference to the sectional cut will show its operation. The steam pressure on disc *C* normally holds it to its seat A slight pull on the lever *X* is sufficient to open the small auxiliary valve *A*. This admits steam through the opening in the center of the stem of the valve *C* to the expansion chamber, where it acts upon the piston *D*, the area of which being larger than that of the valve *C* forces the same from its seat and allows the steam to pass through the valve. As long as the auxiliary valve *A* is held open, the main valve *C* will be kept off its seat and steam will pass through the valve. When the pull on the lever is released, the pressure of the steam closes the auxiliary valve *A*, and the main valve *C* closes easily and without shock or jar, as the steam which is entrapped in the expansion chamber tends to cushion and retard its movement. There is very little wear on the two valve seats and they can be easily reground by taking off the cap at end.

"These whistle valves are made of gun-metal composition and are substantially and durably constructed. They are made in all sizes from 1 to 3 in., inclusive, with screw, flange, or screw and flange ends, and are guaranteed for 175 lbs. working pressure. Extra heavy patterns for 350 lbs. working pressure can also be furnished."

A LIFE STORY.

"A Life Story" is the title of a little leaflet issued by the H. W. Johns-Manville Co., No. 100 William street, New York, describing the long service of some of their asbestos high-pressure packing rings. Accompany this article is a photograph of one of the asbestos high-pressure packing rings (Class C, square), wire interwoven. In 1896 it was packed with seven others in the stuffing box at the steam end of a Worthington duplex compound steam pump used in elevator service, Woodbridge building, New York city. It worked continuously under 125 lbs. pressure with pump capacity of 3,000,000 gallons every twenty-four hours. This packing has been in constant use for six years without causing the engineer the slighest trouble and is in such excellent condition as to permit of further efficient service. The rod is still perfectly smooth. The manufacturers are, of course, very proud of this piece of packing and have taken pains to direct attention to it through photographs.



Mr. Charles Ward of Charleston, W. Va., is an advocate of the propeller in place of the stern-wheel for navigation on western rivers. He has just constructed the James Ramsey, a twin-screw steamer for the government engineer's department. The steamer is 120 ft. long, 22 ft. beam and 4 ft. 6 in. deep. As a test of her power she was lashed to the crack stern-wheel river boat D. T. Lane, bow and bow. Both steamers used all the power they possessed and the Ramsey succeeded in pushing the Lane up river against quite a strong current.

The total output of iron ore in Russia in 1901 was 2,317,000 tons.

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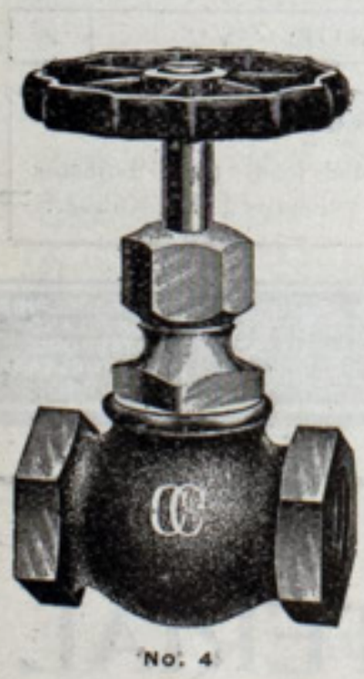

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These valves are heavier than the "Standard" and are made of Crane Hard Metal, which is nearly as hard as Steel and wears longer than any other bronze composition known. They also have a conical seat, which some engineers prefer. Are extensively used and have given excellent satisfaction. Write for

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ELECTRIC HOISTS FOR DOCK WORK.

For handling bales, barrels and pieces weighing from a few hundred pounds to two or three tons from ship to dock the electric hoist is admirably adapted. Electric motors are fast displacing steam engines and shafting on account of their economy in operation, and nowhere is this more apparent than in intermittent hoisting work. With an electric hoist there is no loss due to condensation in long steam pipes and there are no pipe lines with joints to keep tight as with steam engines. With shafting the loss in transmission of power due to the friction at the bearings is very high. At one steamship dock in New York city it was estimated that it took three tons of coal per day to run the shafting alone. This loss is practically eliminated with electric power. An electric hoist may be stationary on a wharf where a great deal of work is to be done, or its base carried on wheels or it can rest on a small wagon. If the hoisting is to be done along the face of a dock the hoist may be mounted on a narrow-guage railway car, the track for which extends the length of the dock. For supplying power to portable hoists the electric mains are run to boxes stationed at intervals. With a cable having a plug terminal which is inserted in the box the hoist can be moved anywhere within the radius of the cable; beyond this the plug is inserted in another box. A 500-volt street railway tvpe of motor is employed for driving. Either direct or alternating-current motors of any commercial voltage may be used. The three essential parts of the hoists are the rope drum, the gearing and the electric motor.

These are made in a series of sizes, and bv a suitable combination of each, a hoist of any desired capacity and speed with the limits of modern practice mav be built. There are four factors that materially affect the size and cost of the hoist, namely, the load, the speed, the height to which the load is hoisted and the frequency of the trips. These factors affect the size, operation and cost in the following manner: If the load is increased the size, weight and strength of the mechanism will be increased; that is, a larger size must be used. If the velocity of hoisting is increased the size and power of the motor will be increased, the other parts remaining the same. If the height to which the load is hoisted is increased the drum must be increased to hold a longer rope, the motor remaining the same. If the frequency of the trips is increased the size of the motor will be increased, the other parts remaining the same.

There are three methods of operating electric hoists: First, running the motor continuously, hoisting the load by throwing in a friction clutch and lowering by a hand brake. This method is suitable either for alternating or direct-current motors. Second, starting and stopping the motor for each lift, lowering by a hand brake. This is better suited for direct-current than alternating motors. Third, running the motor forward to hoist and backward to lower. A direct-current motor, with reversing drum and switches, is used for this work. The mechanism of the hoist is so arranged that any size or make of electric motor may be used. The motor is connected to the hoist by a flexible insulated coupling.

The great flexibility of electric transmission allows hoists to be installed to advantage in many situations where it is difficult or expedient to use steam-driven machinery. One of the great advantages is that the expense for power begins when the hoist is started and entirely ceases when the motor is stopped.

The electric hoists made by the C. W. Hunt Co., West New Brighton, S. I., are especially adapted for dock work and possess all the advantages outlined.

A telegram from John R. Bennett of New York. general patent counsel for the Chicago Pneumatic Tool Co., reports to that company an important opinion from the United States circuit court. The opinion is given in the case of the Chicago Pneumatic Tool Co. against the Franklin Boiler Works Co. for using the tools of the Philadelphia Pneumatic Tool Co. of Philadelphia. "After overruling all of the defenses interposed," says Mr. Bennett, "the opinion fully sustains the second claim of the Chicago company's Moffett patent, finds the Philadelphia company's tools to be an infringement and continues the injunction against them. Under this opinion the injunction against the Philadelphia Pneumatic Tool Co. will be restored and continued in full force and effect. A point of special importance to the users of pneumatic tools is that this opinion of the circuit court of appeals establishes the Chicago company's right to an injunction against all users of the Philadelphia company's infringing tools. The litigation in which this opinion is given has been most vigorously contested by the Philadelphia company, who assumed the defense of its customer, the Franklin Boiler Works Co."

The Worcester Polytechnic Alumni Association of New York, held a well attended and enthusiastic meeting at the Hotel Albert, Eleventh street and University place, New York city, on Tuesday evening, Mar. 17. The association includes seventy-five graduates of the institute, the majority of whom hold prominent positions in various engineering and manufacturing concerns in New York city. The next meeting will be held at the same place on April 28 and all Worcester graduates are cordially invited to be present.

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$10 Reward.

William Kerr Reid Wanted.

The above reward will be paid to any person giving the present location of William Kerr Reid within thirty days from the publication of this notice.

Came to America from Glasgow, Scotland, in 1894; worked in Erie, Pa., in 1895; bo rded at 115 and 150 East 2d Street; was in Cleveland. O., in 1896; left there for New York City in 1896 or 1897 in search of work, stating he would go sailing on salt water again if unable to find work; was an A B. sailor, and sailed on boats on the G eat Lakes during the above years. Address, THOMPSON & THOMSON, Birmingham, Alabama.

Steam Yacht for Sale.

Steam yacht, 30 ft. over all, 7-ft. beam. Fitted for salt water use. Burns kerosene. Is in fine order. Will be sold cheap. J. L. Alberger, 695 Ellicott Square, Buffalo, N. Y. Apr. 30.

Salesman Wanted.

An article for every boat Not new. Saves money while improving service Large profits. Address Box 40, Marine Review Pub. Co., 39-41 Wade Bldg., Cleveland O. tf

Position Wanted.

Steel Ship and Yacht Building.

First class mechanic will be open for engagement after April 6, to take charge of the construction of steel boat work. First class references. Address ship builder, Care Marine Review Pub. Co., 39-41 Wade Bldg., Cleveland. April 9.

A. J. MORSE & SON.

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140 CONGRESS ST. BOSTON.

Steamer and Tow Barge for Sale.

For Sale—Canadian steamer Orion, class A-2. Capacity 30,000 bushels of wheat or 500 M ft. of lumber or 900 tons coal.

Canadian tow barge Muskoka, A-2. Capacity 30,000 bushels wheat, or 600 M ft. of lumber, or 900 tons coal.

For particulars apply to Collins Bay Rafting & Forwarding Co., Ltd., Kingston, Ont. June 18.

Towing Outfit for Sale.

For Sale—Complete towing outfit including tug, scow, sand pump, etc. All in good order; reasonable price. Address Butler Bros., St Paul Minn. Apr. 2.

Steamer for Sale.

The steam barge Arcadia; length 118.8 ft., breadth 26.2 ft. Tonnage 230 gross, 145 net. Address: The Henry Starke Land & Lb'r. Co., Arcadia, Manistee Co., Mich. t. f.

U. S. Engineer Office, Grand Rapids, Mich., Mar. 12, 1903. Sealed proposals for extension of west breakwater at Petoskey, Mich., will be received here until 3 p m., April 11 1903, and then publicly opened. Information furnished on application. CHARLES KELLER, Capt. Engrs. Apr. 9.

U. S. Engineer Offiee, Duluth, Minn., Mar. 12, 1903. Sealed proposals for furnishing 6,000 barrels Portland cement for concrete superstructure to breakwater at Marquette, Mich., will be received here until noon Apr, 11. 1903, and then publicly opened. Information on application. D. D. GAILLARD, Capt., Engrs, Apr. 9.

U. S. Engineer Office, Duluth, Minn., Mar. 25, 1903. Sealed proposals for furnishing 7,000 cu. yds. broken stone and 4,000 cu. yds. sand for Concrete Superstructure to breakwater, Marquette, Mich., will be received here until noon April 24, 1903, and then publicly opened. Information on application. D. D. GAILLARD, Capt., Engrs. April 16.

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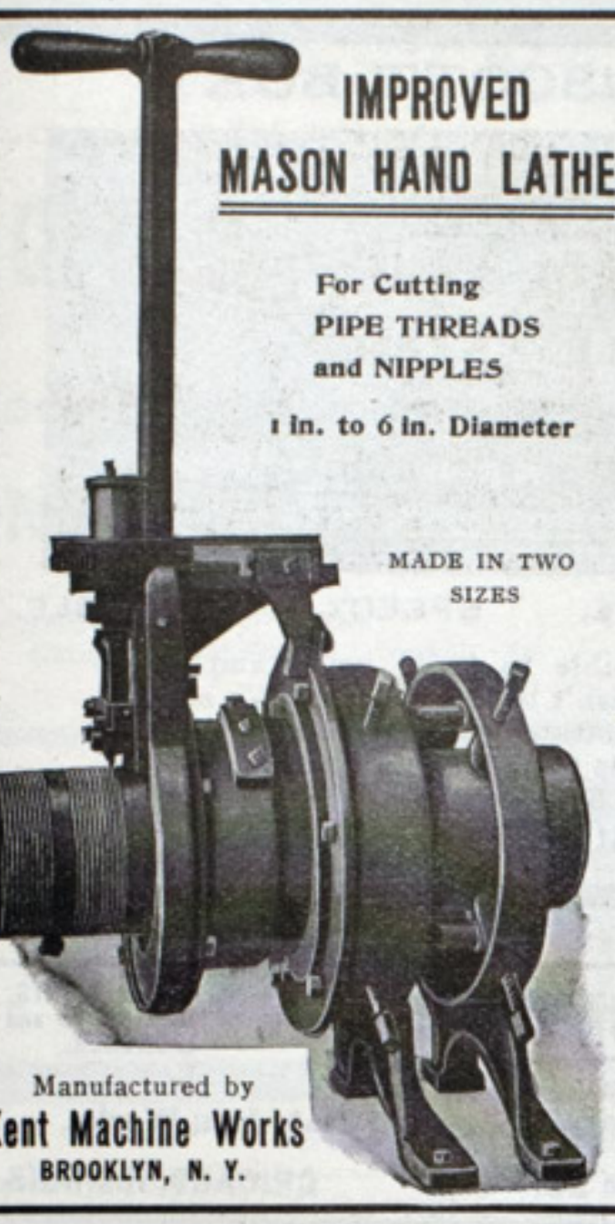

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James Battle. (Detroit Fire Boat). On the ways.
James Battle. (Detroit Fire Boat). The launch.
Castalin.
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Chippawa.
City of Bangor.
City of Erie at Buffalo Docks.
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Harlem.
Harvard. (On the Ways).
Harvard. (The Launch).
Harvard. (In the Slip—Two Views).
Helena.
Hennepin.
Islander. (Thousand Islands—Two Views).
Frank E. Kirby at Put-in-Bay.
Lackawanna.
Mahoning.
Hahoning.
Michigan Central in Detroit River. (Winter).
Mohawk.
Montana.
W. B. Morley, wreck in Detroit River, Aug. 6, 1899.
Simon J. Murphy. (On the Ways).
Simon J. Murphy. (On the Ways—Two Views).
Simon J. Murphy, Launch. (Bow in Slip, Stern not yet in Water).
Neshoto.
New Island Wanderer. (Thousand Islands).
New York. (Thousand Islands—Two Views).
North King. (Thousand Islands).
North Land, in the "Soo" Locks. (Two Views).
North Land, at Mackinac Island. (Two Views).
North Land and North West in Winter Quarters.
Ongiara. (Two Views).
Peerless, at Mackinac Island.
Pleasure, at Dock (Detroit Ferry).
E. C. Pope.
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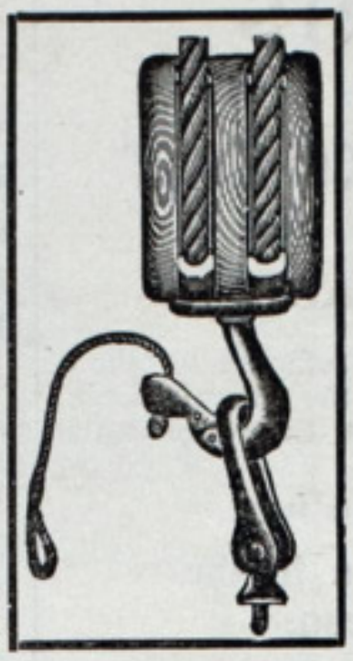

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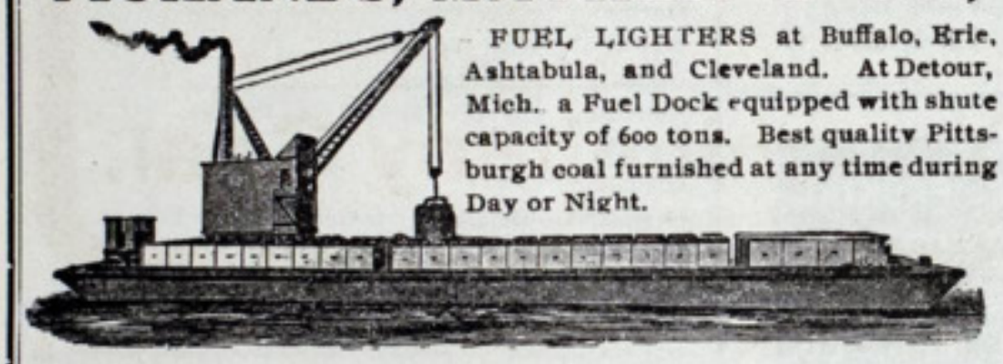

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Cramp, Wm. & Sons.....Philadelphia.
Dearing Water Tube Boiler Co.....Detroit.
Delauney Belleville & Co.....St. Denis, France.
Detroit Shipbuilding Co.....Detroit.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Ship & Engine Co.....Quincy, Mass.
Forest City Boiler Co..... ..... Cleveland.
Jenks Ship Building Co.....Port Huron, Mich.
Kingsford Foundry & Machine Works..Oswego, N. Y.
Lake Erie Boiler Works.....Cleveland.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Milwaukee Dry Dock Co. .....Milwaukee.
Moran Bros. Co.....Seattle, Wash.
Mosher, Chas. D.....New York.
Neafie & Levy Ship & Engine Building Co...Phila.
Newport News Ship Building Co..Newport News, Va.
Nixon, Lewis .....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works .....San Francisco.
Roberts Safety Water Tube Boiler Co...New York.
Stirling, The Co.....Chicago.
Superior Ship Building Co.....Superior, Wis.
Taylor Water Tube Boiler Co.....Detroit.
Trigg, Wm. R Co.....Richmond, Va.
Union Machine & Boiler Co.....Cleveland.
Warrington Iron Works.....Chicago.
Willard, Chas. P. & Co .....Chicago.

BOILER COMPOUNDS.

Dearborn Drug & Chemical Works.....Chicago.

BOILER COVERING.

Johns-Manville Co., H. W.....New York.

BOILER RIVETS.

Bourne-Fuller Co.....Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co. .....Cuyahoga Falls, O.

BRASS AND BRONZE CASTINGS.

Cramp, Wm. & Sons .....Philadelphia.
Fore River Ship & Engine Co.....Quincy, Mass.
Macbeth Iron Co.....Cleveland.
Phosphor Bronze Smelting Co. .....Philadelphia.

BRASS—SHEET, ROD, ETC.

Waterbury Brass Co .....New York.

BRASS WORK, MARINE.

Farnan Brass Works .....Cleveland.

BRIDGES, BUILDERS OF

Scherzer Rolling Lift Bridge Co. .....Chicago.

BUCKETS, ORE AND COAL.

Bartlett & Snow Co., C. O. .....Cleveland.
Brown Hoisting & Conveying Machine Co. Cleveland.
Lake Erie Boiler Works.....Cleveland.
Webster, Camp & Lane Co.....Akron, O.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

CAPSTANS.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co. .....Bath, Me.

CARPETS, RUGS, FURNITURE, ETC.

Sterling & Welch Co.. .....Cleveland
Williams & Rodgers Co., The ... .Cleveland

CAST IRON PIPE.

Wood & Co., R. D. .....Philadelphia.

CEMENT, IRON, FOR REPAIRING LEAKS.

Smooth-On Mfg. Co. .....Jersey City, N. J.

CHAINS.

Standard Chain Co. .....Pittsburg.

CHAIN HOISTS.

Boston & Lockport Block Co. .....Boston, Mass.
Dake Engine Co. .....Grand Haven, Mich.

CHARTS.

Marine Review Pub. Co.....Cleveland.
Potter, J. D.....London.

CIRCULATOR, EQUILIBRIUM,

With Steam Heating Attachment.
Bloomsburg & Co., H. .....Baltimore, Md.

CLOCKS (Marine), CHRONOMETERS, BELLS.

Ashton Valve Co. .....Boston.
Bliss, John & Co. .....New York.
Chelsea Clock Co. .....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.

Castner, Curran & Bullitt .....Boston.
Graham Coal & Coke Co., Ltd.....Detroit.
Hanna, M. A. & Co. .....Cleveland.
Pickands, Mather & Co. .....Cleveland.
Pittsburg Coal Co. .....Cleveland.
Rochester & Pittsburg Coal & Iron Co. ....Buffalo.

COAL AND ORE HANDLING MACHINERY.

Bartlett & Snow Co., C. O. .....Cleveland.
Brown Hoisting Machinery Co., (Inc.)...Cleveland.
Lidgerwood Mfg. Co.....New York.
Webster, Camp & Lane Co.....Akron, O.

COMPASSES.

Bliss, John & Co. .....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COMPASS ADJUSTER.

Fields, Capt. J. M..... Cleveland

CONDENSER TUBE PACKING.

Allen, Joseph .....Collingswood, N. J.

CONTRACTORS FOR PUBLIC WORKS.

Smith Co., L. P. & J. A. .....Cleveland.

COPPER, TIN AND SHEET IRON WORK.

Lake Erie Boiler Works.....Cleveland.
McCutcheon, C. H.....Buffalo.
Topky Brothers .....Ashtabula, O.

COPPER—SHEET, TUBES AND ROD.

Waterbury Brass Co.....New York.

CORDAGE.

Baker & Co., H. H.....Buffalo.
DeGrauw, Aymar & Co.....New York.
Upson-Walton Co.....Cleveland.

CORK JACKETS AND RINGS.

Armstrong Cork Co. ....Pittsburg, Pa.
Kahnweiler's Sons, D. ....New York.
Lane & DeGroot ..... Long Island City, N. Y.

CHAIN CONVEYORS, HOISTS.

Bartlett & Snow Co., C. O. .....Cleveland.
Brown Hoisting Machinery Co., (Inc.)...Cleveland.
Chicago Pneumatic Tool Co. .....Chicago.
General Electric Co. .....Schenectady, N. Y.
Lidgerwood Mfg. Co.....New York.
Railway Appliances Co .....Chicago.
Westinghouse Electric & Mfg. Co. .....Pittsburg.

DEAD-LIGHTS, AIR-PORTS, ETC.

"Long-Arm" System Co. .....Cleveland.

DIPPER TOOTH FOR DREDGES AND STEAM EXCAVATORS.

Pryor Patent Excavator Tooth Co..Houghton, Mich.

DIVING APPARATUS.

Morse, A. J. & Son.....Boston.
Schrader's Son, A. .....New York.

DOORS, WATER TIGHT, ETC.

Long Arm System Co.....Cleveland.

DRAWING MATERIALS.

Schwencke, Kirk & Co.....New York.

DREDGE ENGINES FOR HANDLING DUMP SCOW LINES.

Superior Iron Works .....West Superior, Wis.

DREDGING CONTRACTORS.

Smith Co., L. P. & J. A. .....Cleveland.

DRILL PRESSES—DRILLS OF ALL KINDS.

Cleveland Punch & Shear Works Co. ....Cleveland.
Railway Appliances Co .....Chicago.

DRYING APPARATUS.

Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co. .....Boston.

DRY DOCKS.

American Ship Building Co. .....Cleveland.
Atlantic Works .....East Boston, Mass.
Baltimore Ship Building Dry Dock Co...Baltimore.
Bath Iron Works, Ltd. .....Bath, Me.
Buffalo Dry Dock Co. .....Buffalo.
Chicago Ship Building Co. .....Chicago.
Craig Ship Building Co. .....Toledo, O.
Cramp, Wm. & Sons .....Philadelphia.
Detroit Ship Building Co. .....Detroit.
Lockwood Mfg. Co. .....East Boston, Mass.
Manitowoc Dry Dock Co.....Manitowoc, Wis.
Marine Construction & Dry Dock Co. ....New York.
Maryland Steel Co. .....Sparrow's Point, Md.
Milwaukee Dry Dock Co. .....Milwaukee.
Moran Bros. Co. .....Seattle, Wash.
Newport News Ship Building Co. Newport News, Va.
Nixon, Lewis .....Elizabeth, N. J.
Pusey & Jones Co. .....Wilmington, Del.
Shipowners Dry Dock Co. .....Chicago.
Superior Ship Building Co.....Superior, Wis.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co. .....Cleveland.
General Electric Co. .....Schenectady, N. Y.
Lidgerwood Mfg. Co.....New York.
Westinghouse Electric & Mfg. Co. ..Pittsburg, Pa.

ELECTRIC FIXTURES AND APPLIANCES.

General Electric Co. .....Schenectady, N. Y.
Seidler-Miner Electric Co. .....Detroit.
United Marine Mfg. & Supply Co.....New York.
Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co. .....Buffalo.
Electro-Dynamic Co. .....Philadelphia.
Elwell-Parker Electric Co. .....Cleveland.
General Electric Co. .....Schenectady, N. Y.
Seidler-Miner Electric Co.....Detroit.
Sturtevant, B. F. Co. .....Boston.
United Marine Mfg. & Supply Co.....New York.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co. .....Philadelphia.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works .....East Boston, Mass.
Bath Iron Works, Ltd. .....Bath, Me.
Buffalo Forge Co. .....Buffalo.
Chicago Ship Building Co.....Chicago.
Chase Machine Co. .....Cleveland.
Columbia Iron Works..... Port Huron.
Craig Ship Building Co. .....Toledo, O.
Cramp, Wm. & Sons .....Philadelphia.
Dake Engine Co.....Grand Haven, Mich.
Detroit Ship Building Co. .....Detroit
Fletcher, W. & A. Co. .....Hoboken, N. J.
Fore River Ship & Engine Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit, Mich.
Hall Bros. .....Philadelphia.
Jenks Ship Building Co. .....Port Huron, Mich.
Lockwood Mfg. Co. .....East Boston, Mass.
MacKinnon Mfg. Co. .....Bay City, Mich.
Maryland Steel Co. .....Sparrow's Point, Md.
Milwaukee Dry Dock Co. .....Milwaukee.
Moran Bros. Co. .....Seattle, Wash.
Mosher, Chas. D. .....New York.
Neafie & Levy Ship & Engine Bldg. Co. Philadelphia.
Newport News Ship Building Co. Newport News, Va.
Nixon, Lewis .....Elizabeth, N. J.
Pusey & Jones Co. .....Wilmington, Del.
Risdon Iron Works .....San Francisco.
Roach's Ship Yard .....Chester, Pa.
Thropp, J. E. & Sons Co. .....Trenton, N. J.
Sheriffs Mfg. Co. .....Milwaukee.
Superior Ship Building Co.....Superior, Wis.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G. .....Buffalo.
Warrington Iron Works .....Chicago.
Willard, Chas. P. & Co. .....Chicago.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son .....New York.
Electro-Dynamic Co. .....Philadelphia.
MacLean Hydraulic Signal Co.....Chicago.
Seidler-Miner Electric Co. .....Detroit.

ENGINEERING SPECIALTIES AND SUPPLIES.

Crane Co. .....Chicago.
Farnan Brass Works .....Cleveland.
Kieley & Mueller .....New York.
McCutcheon, C. H. .....Buffalo.
New York Belting & Packing Co.....New York.
Reilly Repair & Supply Co., James.....New York.

ENGINEERS, MARINE, MECHANICAL, CONSULTING.

Electro-Dynamic Co. .....Philadelphia.
Garrett-Cromwell Engineering Co.....Cleveland.
Gaskin, Edward .....Buffalo.
Hunt, Robt. W. & Co. .....Chicago.
Kidd, Joseph .....Duluth, Minn.
Logan, Robert .....Cleveland.
Mosher, Chas D. .....New York.
Newman, R. L.....New York.
Pittsburg Testing Laboratory, Ltd.....Pittsburg.
Powell, Ambrose V. .....Chicago.
Roelker, H. B. .....New York.
Sadler, Perkins & Field.....New York.
See, Horace .....New York.
Wood, W. J. ....Chicago.

EVAPORATING AND DISTILLING APPARATUS.

Reilly Repair & Supply Co., James....New York.

FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co. .....Buffalo.
Sturtevant, B. F. Co. .....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert .....Buffalo.
Reilly Repair & Supply Co., James.....New York.
Ross Valve Co. .....Troy, N. Y.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

General Electric Co. .....Schenectady, N. Y.
Seidler-Miner Electric Co. .....Detroit.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

FORGES.

Buffalo Forge Co. .....Buffalo.
Sturtevant, B. F. Co. .....Boston.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co. .....Cleveland.
Fore River Ship & Engine Co. .....Quincy, Mass.
Macbeth Iron Co.....Cleveland.

FLUE WELDING.

Fix's, S. Sons .....Cleveland.

FURNACES FOR BOILERS.

Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.

Castner, Curran & Bullitt (Pocahontas) ....Phila.
Graham Coal & Coke co., Ldt.....Detroit.
Hanna, M. A. & Co. .....Cleveland.
Pickands, Mather & Co. .....Cleveland.
Pittsburg Coal Co. .....Cleveland.
Rochester & Pittsburg Coal & Iron Co. ....Buffalo.
Smith, Stanley B. & Co. .....Detroit.
Youghiogheny & Lehigh Valley Coal Co...Chicago.

GASKETS, RUBBER.

New York Belting & Packing Co.....New York.

GAS BUOYS.

Safety Car Heating & Lighting Co. ..New York.

GAS AND GASOLINE ENGINES.

Chase Machine Co. .....Cleveland.

GAGES, STEAM AND VACUUM.

American Steam Gauge Co. .....Boston.
Ashton Valve Co. .....Boston.

GRAPHITE.

Dixon Crucible Co., Joseph .....Jersey City, N. J.

HAMMERS, STEAM.

Chase Machine Co. .....Cleveland.
Railway Appliances Co .....Chicago.

HARDWARE, SHIP.

Topky Brothers .....Ashtabula, O.

HATCH GEARS.

"Long-Arm" System Co. .....Cleveland.

HEATING APPARATUS.

Buffalo Forge Co. .....Buffalo.
Sturtevant, B. F. Co. .....Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co., Inc. ....Cleveland.
Chase Machine Co. .....Cleveland.
Elwell-Parker Electric Co. .....Cleveland.
General Electric Co. .....New York.
Hyde Windlass Co. .....Bath, Me.
Lidgerwood Mfg. Co.....New York.
Marine Iron Co. .....Bay City.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

HOLLOW STAYBOLT IRON.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

HOSE FITTINGS.

Farnan Brass Works. .....Cleveland.

HOSE, RUBBER.

New York Belting & Packing Co.....New York.

HYDRAULIC MACHINERY.

Watson-Stillman Co., The.....New York.
Wood & Co., R. D. .....Philadelphia.

ICE MACHINERY.

American Linde Refrigerating Co. .....New York.
Roelker, H. B. .....New York.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co. .....Boston.
Ashton Valve Co. .....Boston.

INJECTORS.

American Injector Co.....Detroit.
Crane Co. .....Chicago.
Jenkins Bros. .....New York.
Lunkenheimer Co. .....Cincinnati.
Penberthy Injector Co. .....Detroit, Mich.

INSURANCE, MARINE.

Brown & Co. .....Buffalo.
Brown, W. W. .....Cleveland.
Dunham, R. J. .....Chicago.
Elphicke, C. W. & Co. .....Chicago.
Fleming & Co., P. H. .....Chicago
Hawgood & Co., W. A. .....Cleveland.
Helm & Co., D. T.....Duluth.
Hutchinson & Co. .....Cleveland.
Insurance Co. of North America....Philadelphia
McCarthy, T. R. .....Montreal.
McCurdy, Geo. L. .....Chicago.
Mitchell & Co. .....Cleveland.
Peck, Chas. E. & W. F. ...New York and Chicago.
Richardson, W. C. .....Cleveland.
Sullivan, D. & Co. .....Chicago.
Weeks, F. H. .....New York.

IRON ORE AND PIG IRON.

Bourne-Fuller Co. .....Cleveland.
Hanna, M. A. & Co. .....Cleveland.
Pickands, Mather & Co. .....Cleveland.

LATHE, FOR CUTTING PIPE THREADS.

Kent Machine Works .....Brooklyn, N. Y.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Marine Construction & D. D. Co.....
.....Mariner's Harbor, S. I., N. Y.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Warrington Iron Works .....Chicago.
Willard, Chas. P. .....Chicago.

LIFE PRESERVERS, LIFE BOATS, BUOYS.

Armstrong Cork Co. .....Pittsburg.
Drein, Thos. & Son .....Wilmington, Del.
Kahnweiler's Sons, D. .....New York.
Lane & DeGroot .....Long Island City, N. Y.
Marine Construction & Dry Dock Co.....
.....Mariner's Harbor, S. I., N. Y.

LIGHTS, SIDE AND SIGNAL.

Helvig, H. A. J.....New York.
Russell & Watson .....Buffalo.

LOGS.

Walker & Sons, Thomas .....Birmingham, Eng.
Nicholson Ship Log Co. .....Cleveland.
Also Ship Chandlers.

LUMBER.

Martin-Barriss Co..... Cleveland.
Moran Bros. Co..... Seattle, Wash.

MACHINISTS.

Chase Machine Co.....Cleveland.
Macbeth Iron Co. .....Cleveland.
Union Machine & Boiler Co.....Cleveland.
Ward Machine Co.....Cleveland.

MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc. .....Philadelphia.

MACHINERY, NEW AND SECOND HAND.

Bowler & Co. Geo. H. .....Cleveland.
Clyde Machine Works.....Chicago.

MAN-HOLES, SWING DOORS, ETC.

"Long-Arm" System Co. .....Cleveland.

MARINE RAILWAYS, BUILDERS OF

Crandall & Son, H. I. .....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.....New York.

MECHANICAL DRAFT FOR BOILERS.

American Ship Building Co. .....Cleveland
Bloomsburg & Co., H. .....Baltimore, Md.
Buffalo Forge Co. .....Buffalo.
Detroit Ship Building Co. .....Detroit
Sturtevant, B. F. Co. .....Boston.

METALLIC PACKING.

American Metallic Packing Co.....Cleveland.
Hayden Mfg. Co., N. L.....Columbus, O.
Katzenstein, L. & Co. .....New York.
U. S. Metallic Packing Co. .....Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co. .....Boston.

MOTORS, GENERATORS—ELECTRIC.

Buffalo Forge Co. .....Buffalo.
Electro-Dynamic Co. .....Philadelphia.
Elwell-Parker Electric Co. .....Cleveland.
General Electric Co. .....Schenectady, N. Y.
"Long Arm" System Co. .....Cleveland.
Seidler-Miner Electric Co. .....Detroit.
Sturtevant, B. F. Co. .....Boston.
United Marine Mfg. & Supply Co.....New York.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

NAUTICAL INSTRUMENTS.

Bliss, John & Co. .....New York.
Ritchie, E. S. & Sons .....Brookline, Mass.

NAVAL ARCHITECTS.

Gaskin, Edward .....Buffalo.
Kidd, Joseph .....Duluth, Minn.
Logan, Robert .....Cleveland.
Mosher, Chas. D. .....New York.
Newman, R. L. .....New York.
Sadler, Perkins & Field.....New York
See, Horace.....New York.
Wood, W. J. .....Chicago.

OAKUM.

DeGrauw, Aymar & Co. .....New York.
Stratford Oakum Co.,.....Jersey City, N. J.

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph .....Jersey City, N. J.
Standard Oil Co. .....Cleveland.

PACKING.

American Metallic Packing Co. .....Cleveland.
American Steam Packing Co. .....Boston.
Crane Co. .....Chicago.
Hayden Mfg. Co., N. L.....Columbus, O.
Jenkins Bros. .....New York.
Katzenstein, L. & Co. .....New York.
New York Belting & Packing Co.....New York.
United States Metallic Packing Co. ....Philadelphia.

PAINTS.

Baker, Howard H. & Co. .....Buffalo.
Berry Bros., Ltd. .....Detroit.
Mohawk Paint & Chemical Co.....New York.
New Jersey Zinc Co. .....New York.
Topky Brothers .....Ashtabula, O.
Upson-Walton Co. .....Cleveland.

PATENT ATTORNEYS.

Thurston & Bates .....Cleveland.

PATTERN SHOP MACHINERY.

Atlantic Works, Inc. .....Philadelphia.

PIPE—BRASS AND COPPER, IRON PIPE SIZE.

Waterbury Brass Co.....New York.

PIPE, WROUGHT IRON.

Bourne-Fuller Co .....Cleveland.
Crane Co .....Chicago.
Macbeth Iron Co.....Cleveland.

PLANING MILL MACHINERY.

Atlantic Works, Inc. .....Philadelphia.

PLATE BENDING AND PLANING MACHINES.

Wood & Co., R. D. .....Philadelphia.

PLUMBING, MARINE.

Mott, J. L., Iron Works .....New York.
Reilly Repair & Supply Co., James....New York.
Sands, Alfred B. & Son .....New York.

PNEUMATIC TOOLS.

Allen, John F., ... New York.
Chicago Pneumatic Tool Co. .....Chicago.
Railway Appliances Co .....Chicago.

POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston.

POWER DOORS AND HATCHES.

"Long-Arm" System Co. .....Cleveland.

PRESSURE REGULATORS.

Kieley & Mueller .....New York
Ross Valve Co. .....Troy, N. Y.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

PROPELLER WHEELS.

American Ship Building Co. .....Cleveland
Atlantic Works .....East Boston, Mass.
Baltimore Ship Building & Dry Dock Co. Baltimore.
Bath Iron Works, Ltd. .....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co. .....Detroit.
Fore River Ship & Engine Co. .....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Hyde Windlass Co. .....Bath, Me.
Jenks Ship Building Co. .....Port Huron, Mich.
Lockwood Mfg. Co. .....East Boston, Mass.
Macbeth Iron Co.....Cleveland.
MacKinnon Mfg. Co. .....Bay City, Mich.
Maryland Steel Co. .....Sparrow's Point, Md.
Milwaukee Dry Dock Co. .....Milwaukee.
Moran Bros. Co. .....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Phila.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis .....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co. .....Wilmington, Del.
Risdon Iron Works .....San Francisco.
Roelker, H. B. .....New York.
Sheriffs Mfg. Co. .....Milwaukee.
Superior Ship Building Co.....Superior, Wis.
Thropp & Sons Co., J. E. .....Trenton, N. J.
Trigg, Wm. R. Co. .....Richmond, Va.
Trout, H. G. .....Buffalo.

PROJECTORS, ELECTRIC.

Elwell-Parker Electric Co. .....Cleveland.
General Electric Co. .....Schenectady, N. Y.
Seidler-Miner Electric Co. .....Detroit.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F. Mfg. Co. .....New York.
Clyde Machine Works .....Chicago.
Great Lakes Engineering Works.....Detroit.
Kingsford Foundry & Machine Wks. Oswego, N. Y.
Long Arm System Co. .....Cleveland.

PUNCHES, RIVETERS, SHEARS.

Chicago Pneumatic Tool Co. .....Chicago.

REFRIGERATING APPARATUS.

Roelker, H. B. .....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register .....Cleveland.
Record of American & Foreign Shipping.New York.

RELEASING HOOKS FOR DETACHING BOATS.

Standard Automatic Releasing Hook Co. New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co. .....Cleveland.

RANGES.

Russell & Watson .....Buffalo.

RIVETS—BRASS AND COPPER.

Waterbury Brass Co.....New York.

RUBBER INSULATED WIRES.

Roebling's Sons, Jno. A...New York and Cleveland.

SAFETY VALVES.

American Steam Gauge Co. .....Boston.
Ashton Valve Co.....Boston.
Hayden Mfg. Co., N. L.....Columbus, O.
Lunkenheimer Co. .....Cincinnati.

SAIL MAKERS.

Baker, Howard H. & Co. .....Buffalo.
Upson-Walton Co. .....Cleveland.
Wilson & Silsby .....Boston.

SALVAGE COMPANIES.

See Wrecking Companies.

SCHOOLS—NAUTICAL, ENGINEERING.

Chicago Nautical School .....Chicago.

SEARCH LIGHTS.

Elwell-Parker Electric Co. .....Cleveland.
General Electric Co. .....Schenectady, N. Y.
Seidler-Miner Electric Co. .....Detroit.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

SHEARS.

See Punches, Rivets, and Shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co. .....Cleveland.

SHIP BUILDERS.

American Ship Building Co. .....Cleveland.
Atlantic Works .....East Boston, Mass.
Baltimore Ship Building & Dry Dock Co..Baltimore.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co. .....Buffalo.
Columbia Iron Works..... Port Huron.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co. .....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Ship Building Co. .....Detroit.
Fore River Ship & Engine Co. .....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Jenks Ship Building Co. .....Port Huron, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Manitowoc Dry Dock Co.....Manitowoc, Wis.
Marine Construction & Dry Dock Co.....
.....Mariner's Harbor, S. I., N. Y.
Maryland Steel Co .....Sparrow's Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Moran Bros. Co. .....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Phila.
Newport News Ship Bldg. Co....Newport News, Va.
Nixon, Lewis .....Elizabeth, N. J.
Pusey & Jones Co. .....Wilmington, Del.
Risdon Iron Works .....San Francisco.
Roach's Ship Yard .....Chester, Pa.
Smith & Son, Abram .....Algonac, Mich.
Trigg, Wm. R. Co. .....Richmond, Va.
Warrington Iron Works .....Chicago.
Willard, Chas. P. & Co. .....Chicago.

SHIP CHANDLERS.

Baker, Howard H. & Co. .....Buffalo.
Moran Bros. Co. .....Seattle, Wash.
Reilly Repair & Supply Co., James....New York.
Upson-Walton Co. .....Cleveland.

SHIP LANTERNS AND LAMPS.

Helvig, H. A. J.....New York.
Page Bros. & Co.....New York.
Russell & Watson.....Buffalo.

SMOOTH-ON COMPOUND, FOR REPAIRS.

Smooth-On Mfg. Co. .....Jersey City, N. J.

SPARS—LARGE SIZES.

Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW, OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSELS FOR SALE.

Elwell, Jas. W. & Co.....New York.
Holmes, Samuel.....New York.
King, Rufus S.....New York.
McCarthy, T. R.....Montreal, Can.
Newman, R. L.....New York.
Weeks, F. H.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line.....New York.
Erie & Western Trans. Co. .....Buffalo.
International Nav. Co.....Philadelphia.
Pere Marquette R. R. & S. S. Line.....Milwaukee.
Red Star Line.....New York.

STEEL CASTINGS.

Seaboard Steel Casting Co.....Chester, Pa.
Macbeth Iron Co.....Cleveland.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
Chase Machine Co. .....Cleveland.
Dake Engine Co.....Grand Haven, Mich.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co.....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriff Mnfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.

Brown, W. W.....Cleveland.
Fahey & Co.....Cleveland.

SUBMARINE DIVING APPARATUS

Morse & Son, A. J.....Boston.
Schrader's Son, A.....New York.

SURVEYORS, MARINE.

Gaskin, Edward.....Buffalo.
Newman, R. L.....New York.
See, Horace.....New York.
Wood, W. J.....Chicago.

TESTS OF MATERIAL.

Hunt, Robert W. & Co.....Chicago.
Pittsburg Testing Laboratory, Ltd.....Pittsburg.

TILING, INTERLOCKING RUBBER.

New York Belting & Packing Co.....New York.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Allen, John F.....New York.
Chicago Pneumatic Tool Co.....Chicago.
Railway Appliances Co .....Chicago.
Watson-Stillman Co.....New York.

TOOLS, WOOD WORKING.

Atlantic Works, Inc.....Philadelphia.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.

Donnelly Salvage & Wrecking Co....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.Midland, Ont.

TRAPS, STEAM.

Kieley & Mueller.....New York.

TRUCKS.

Boston & Lockport Block Co..... .....Boston.

TUBING, SEAMLESS.

National Tube Co.....Pittsburg.
Waterbury Brass Co.....New York.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co. .....Boston.
Ashton Valve Co. .....Boston.
Crane Co. .....Chicago.
Farnan Brass Works .....Cleveland.
Hayden Mfg. Co., N. L.....Columbus, O.
Jenkins Bros.....New York.
Kieley & Mueller.....New York.
Lunkenheimer Co.....Cincinnati.
Ross Valve Co. .....Troy, N. Y.

VALVES FOR WATER AND GAS.

Wood & Co., R. D.....Philadelphia.
Ross Valve Co. .....Troy, N. Y.

VARNISHES.

Berry Brothers, Ltd.....Detroit.
New Jersey Zinc Co.....New York.
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VESSEL CASTINGS.

American Ship Building Co.....Cleveland.
Macbeth Iron Co.....Cleveland.

VESSEL FURNISHINGS.

Sterling & Welch Co., ... Cleveland
Williams & Rodgers Co., The..... .. Cleveland

VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Brown, W. W.....Cleveland.
Dunham, R J..... .....Chicago.
Elwell, Jas. W. & Co.....New York.
Elphicke, C. W & Co.....Chicago.
Fleming & Co., P. H. .... Chicago
Hall & Root.....Buffalo.
Helm & Co., D. T. .....Duluth.
Hawgood & Co., W. A.....Cleveland.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
King, Rufus S.....New York.
McCarthy, T. R.....Montreal.
Newman, R. L.....New York.
Mitchell & Co.....Cleveland.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Weeks, F. H.....New York.

VENTILATING APPARATUS FOR SHIPS.

Buffalo Forge Co. .....Buffalo.
Sturtevant, B. F. Co.....Boston.

WIRE—BRASS AND COPPER.

Waterbury Brass Co.....New York.

WIRE ROPE AND WIRE ROPE FITTINGS.

Baker, H. H. & Co.....Buffalo.
DeGrauw, Aymar & Co. .....New York
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co. .....Boston.
Ashton Valve Co. .....Boston.
Farnan Brass Works .....Cleveland.
Lunkenheimer Co.....Cincinnati.

WHITE METAL—SHEETS, RODS AND WIRE.

Waterbury Brass Co.....New York.

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American Ship Windlass Co.....Providence, R. I.
American Ship Building Co. .....Cleveland
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.

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Hyde Windlass Co.....Bath, Me.

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Midland Towing & Wrecking Co., Ltd.Midland, Ont.

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Lane & DeGroot.....Long Island City, N. Y.
Marine Construction & Dry Dock Co. ...New York.
Truscott Boat Mfg. Co. .....St. Joseph, Mich.
Warrington Iron Works.....Chicago.
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No. 20, Chi & Cleve Ex....	*7:20am	.....
No. 28 N Y & Bost Ex ..	*7:40am	*8:00am
No. 40, Toledo & Buff Ac.	†10:00am	†10:40am
No. 32, Fast Mail	*11:25am	*11:30am
No. 44, Ac via Sandusky..	†1:40pm	..
No. 46, Southwestern Ex.	....	*3:00pm
No. 106, Conneaut Accom	....	†4:30pm
No. 6, Lim Fast Mail....	*5:40pm	*5:45pm
No. 26, 20th Cent Lim. ...	*7:40pm	*7:43pm
No. 10, C., N Y & B Sp....	*7:30pm	*7:50pm
No. 16, New Eng Ex.....	*10:30pm	*10:35pm
No. 2, Day Express. ..	†9:10pm	†9 25pm
No. 126, Norwalk Accom.	†7:50am	.....

	Arrive from East.	Depart West.
Westward.		
No. 11, Southwestern Lim	*3:25am	....
No. 7, Day Express.	.....	†6:10am
No. 15, Bost & Chi Sp.....	*3:10am	*3:15am
No. 19, Lake Shore Lim..	*7:15am	*7:20am
No. 23, Western Express.	*10:30am	*10:35am
No. 33, Southern Express	*12:25pm	....
No. 133, Cleve & Det Ex..	.....	*12:45pm
No. 47, Accomodation.....	†11.20am	†3:00pm
No. 141, Sandusky Accom.	....	†3:10pm
No. 43, Fast Mail	*4:35pm	*4:40pm
No. 127, Norwalk Accom..	.. ..	†5:10pm
No. 37 Pacific Express...	*7:00pm	*7:20pm
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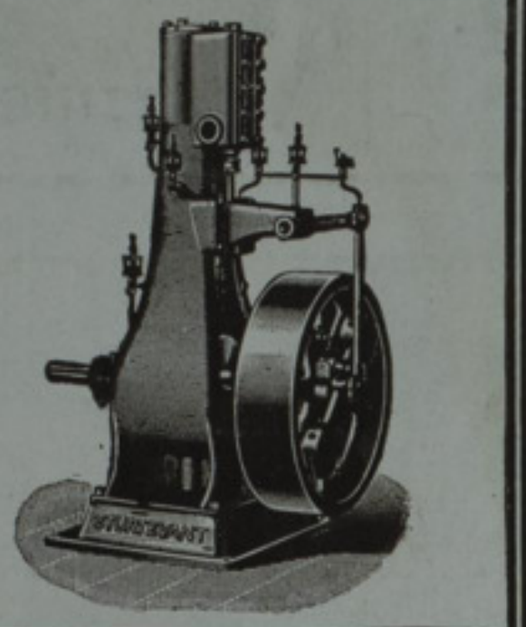

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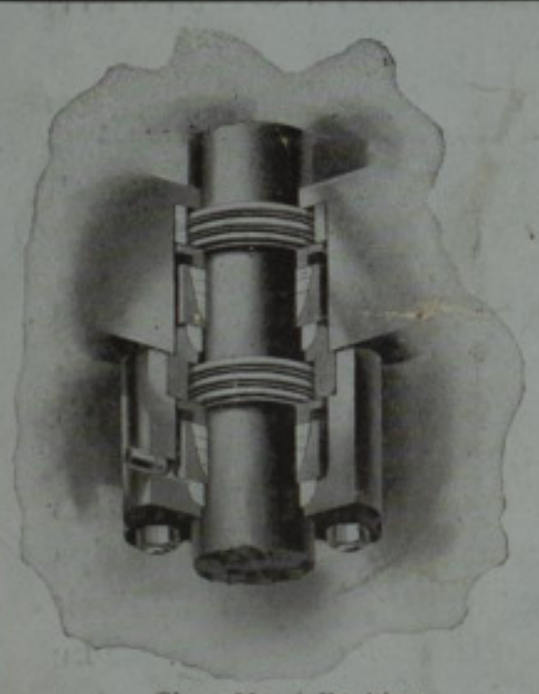

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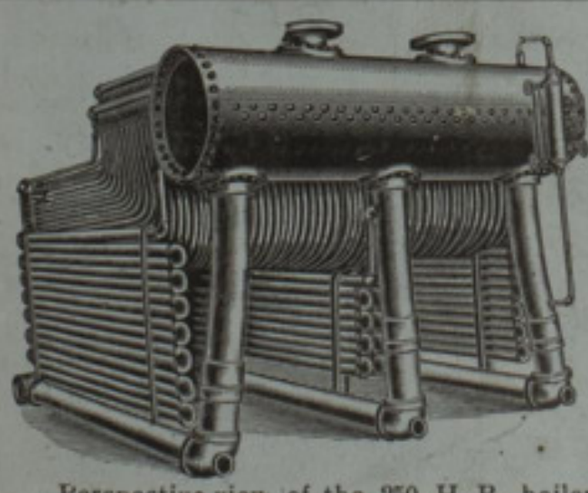

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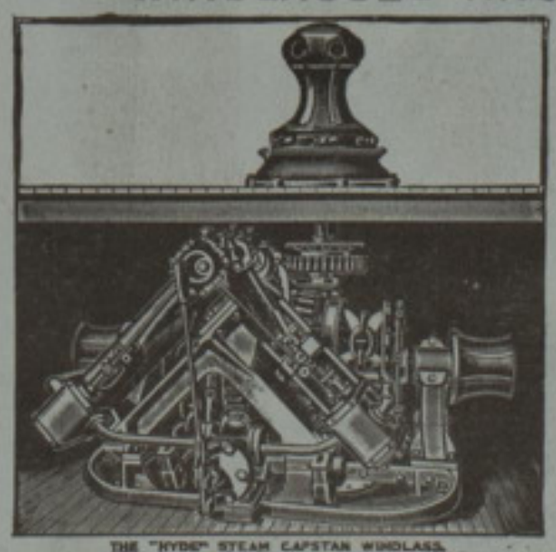

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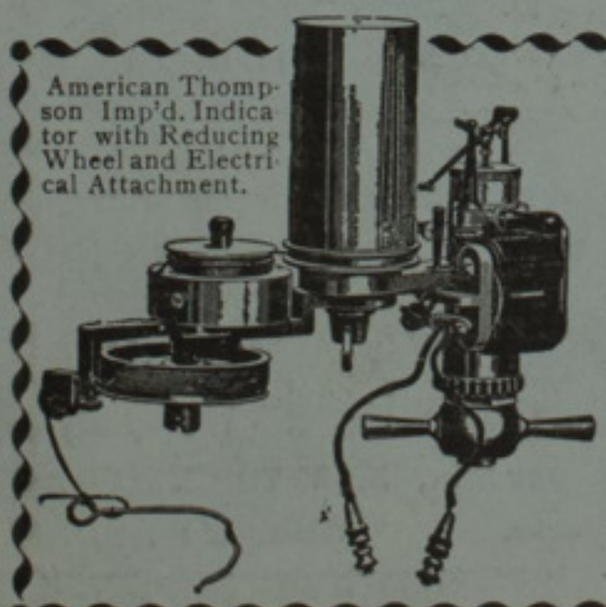

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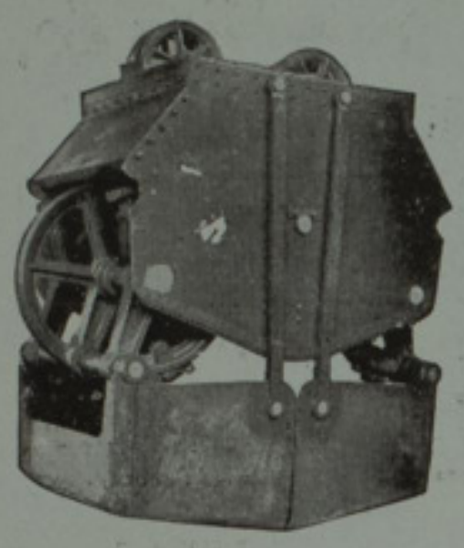

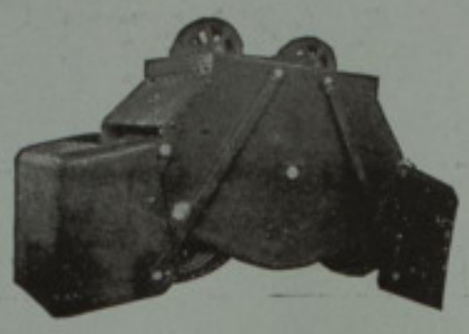

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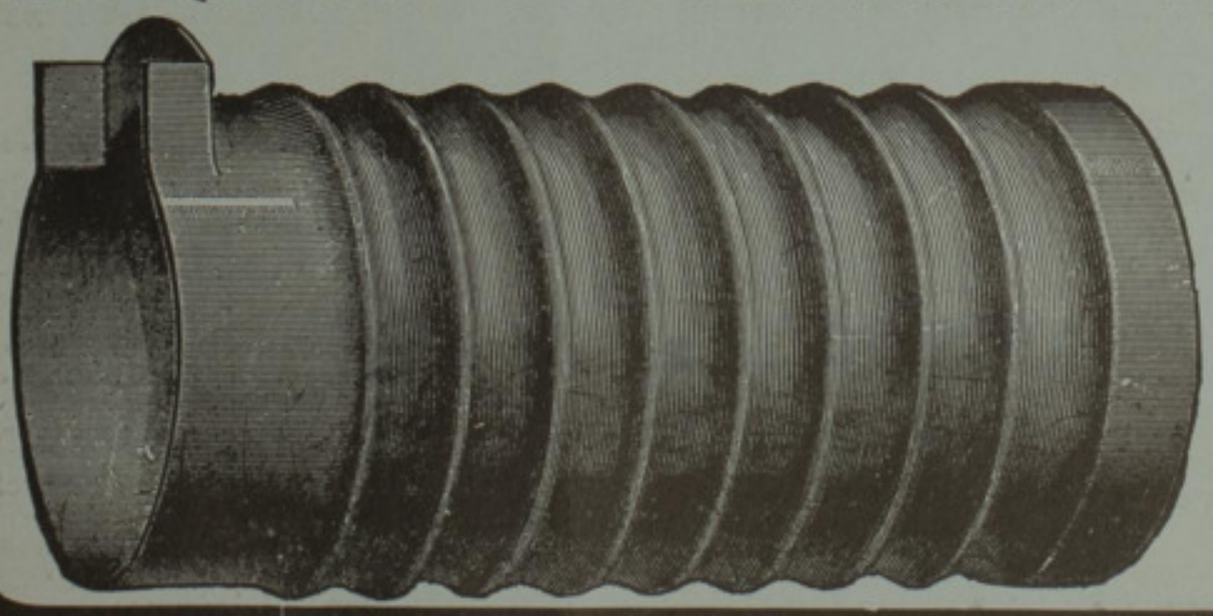

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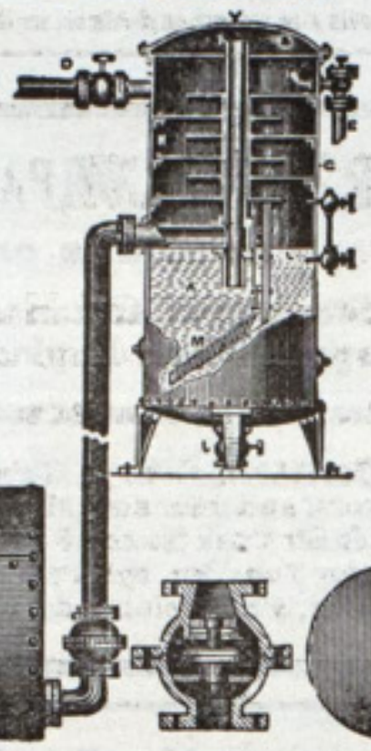

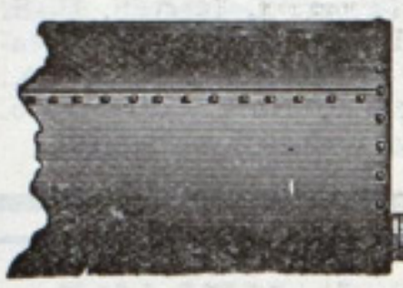

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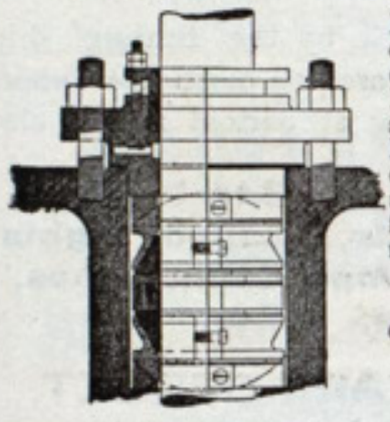

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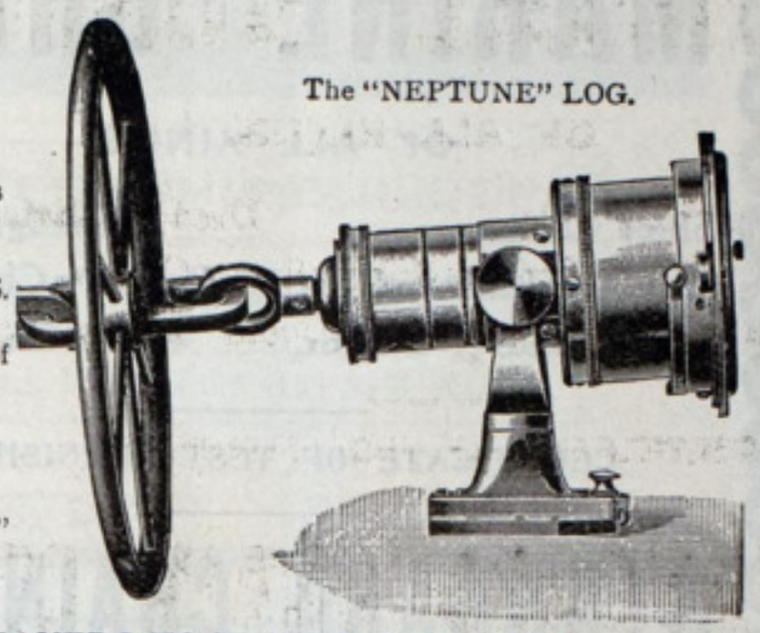

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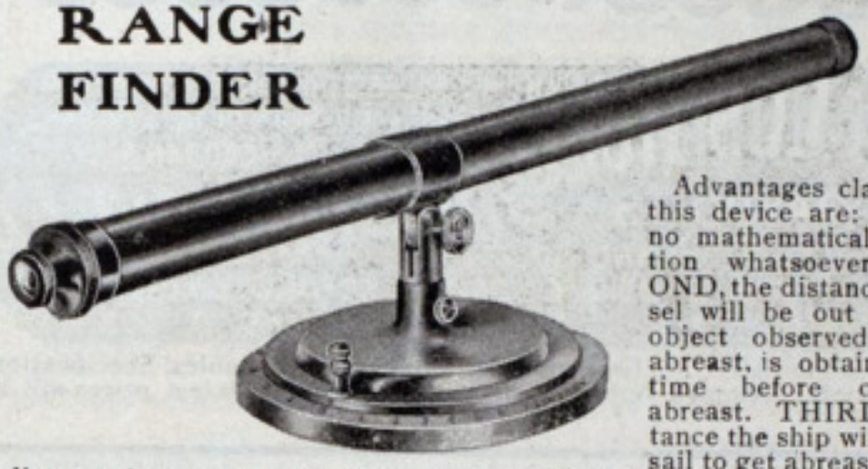

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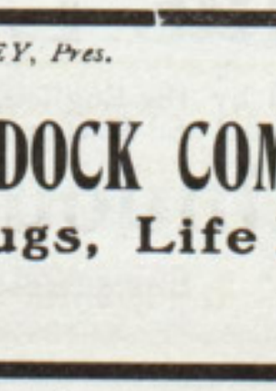

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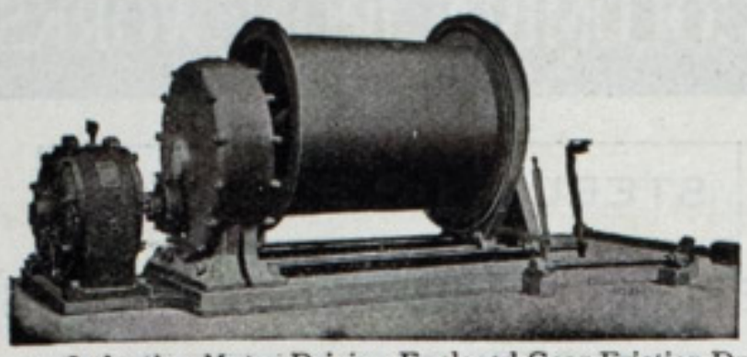

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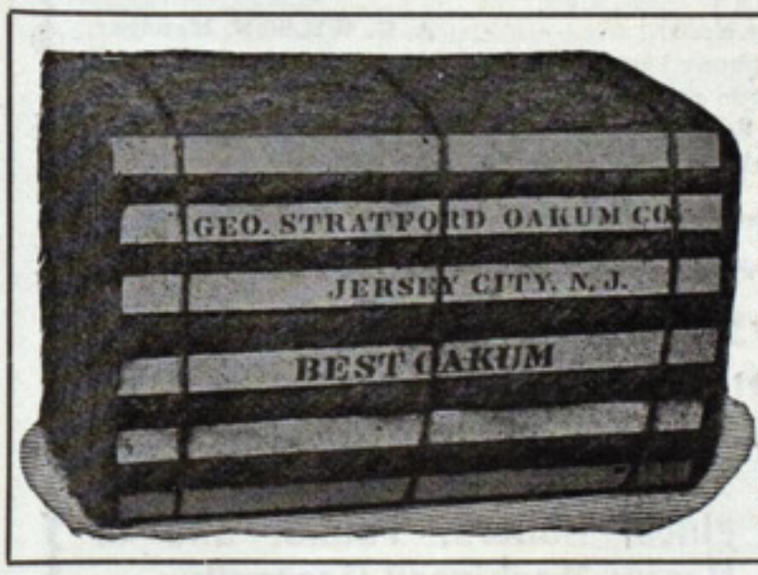

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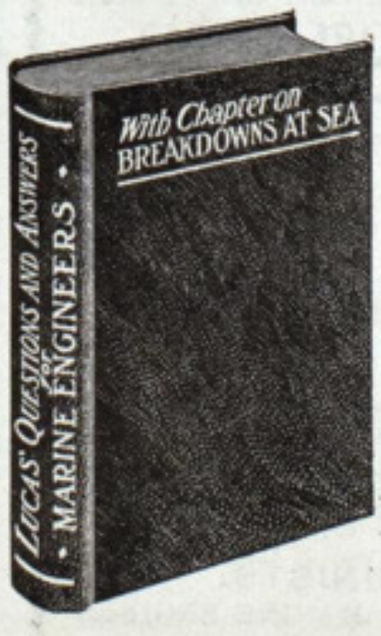

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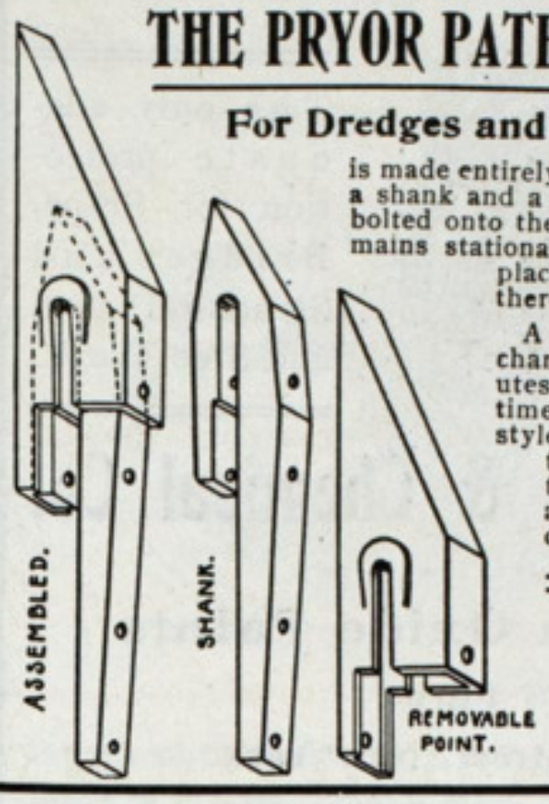

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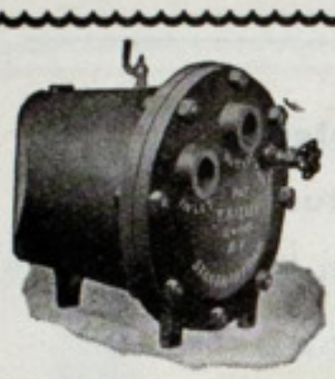

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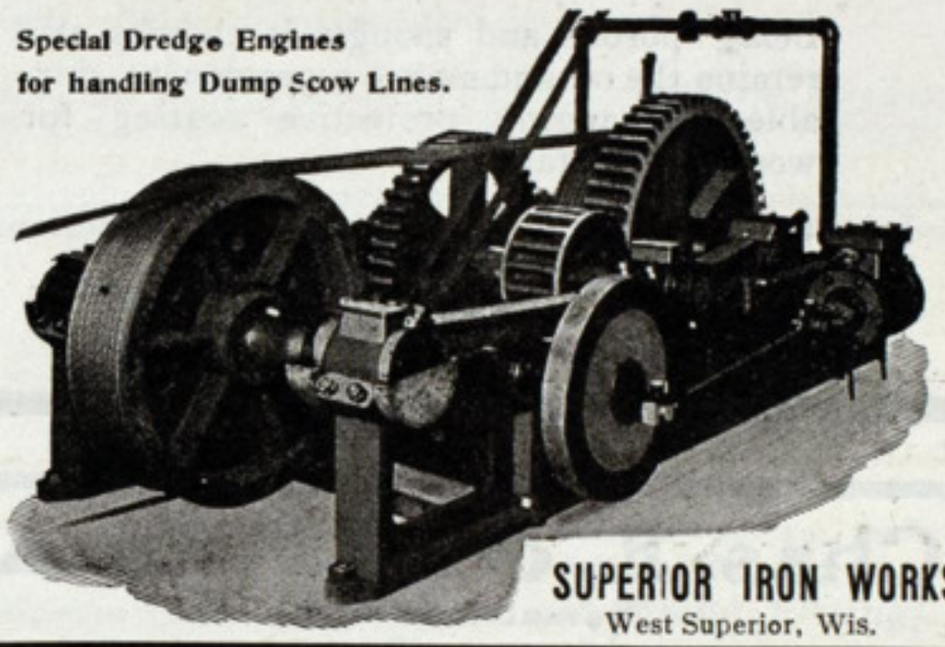

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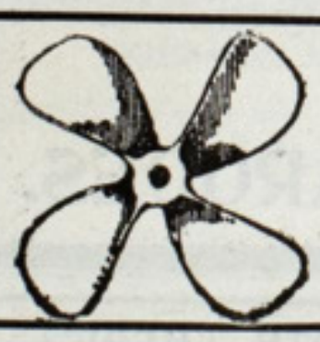

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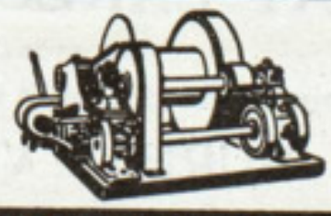

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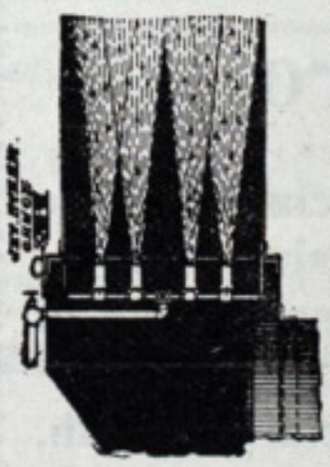

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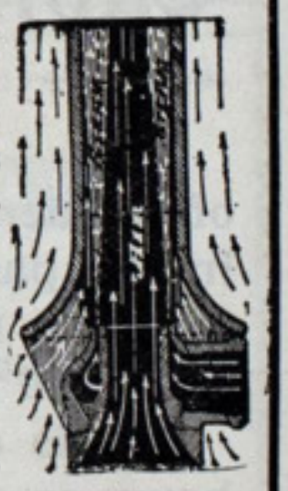

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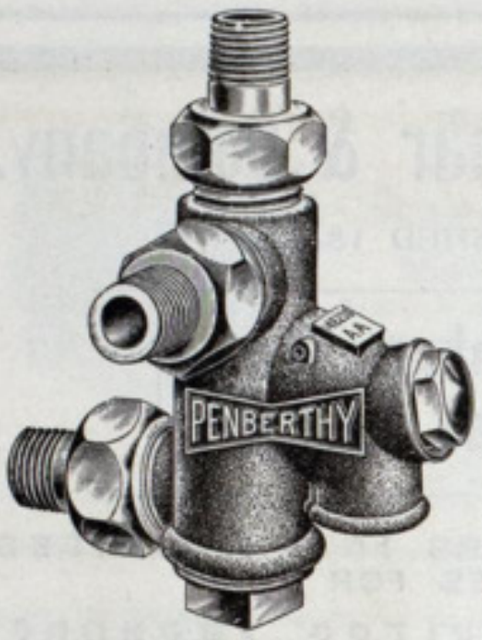

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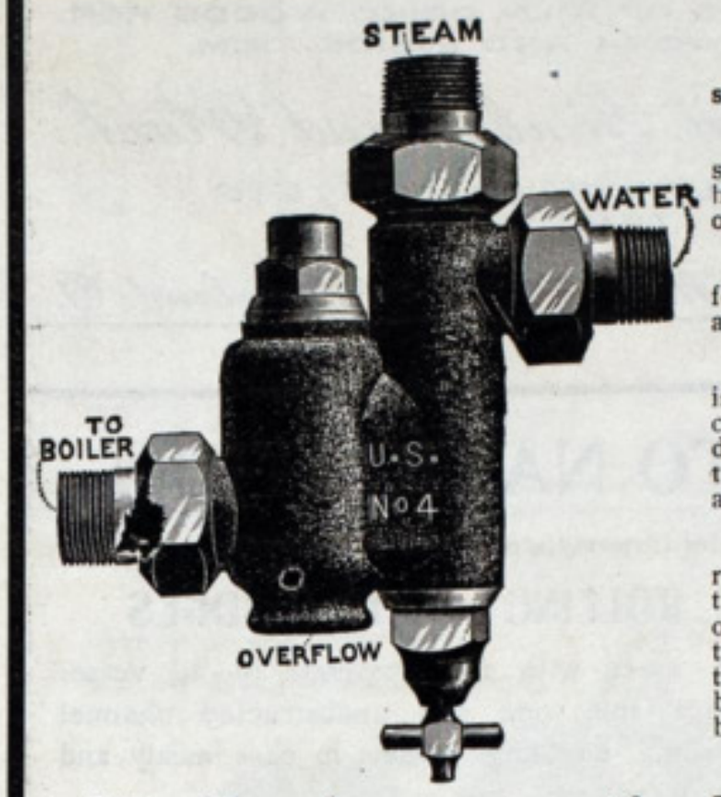

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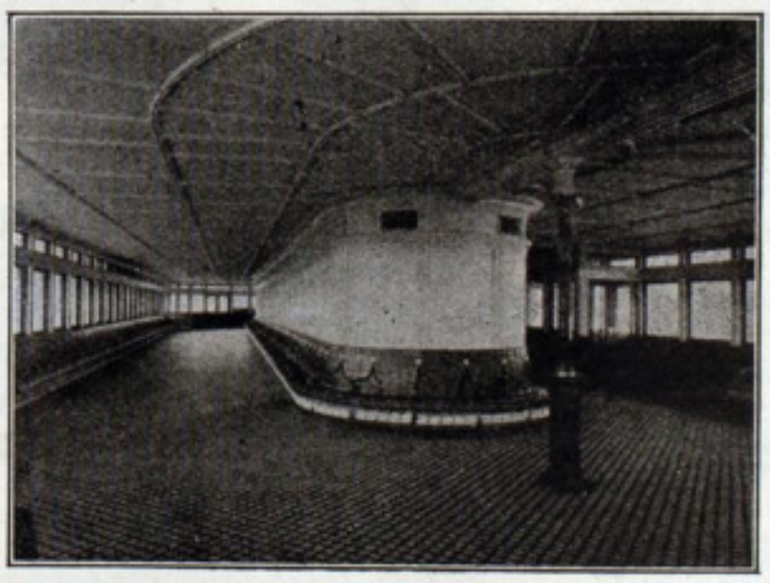

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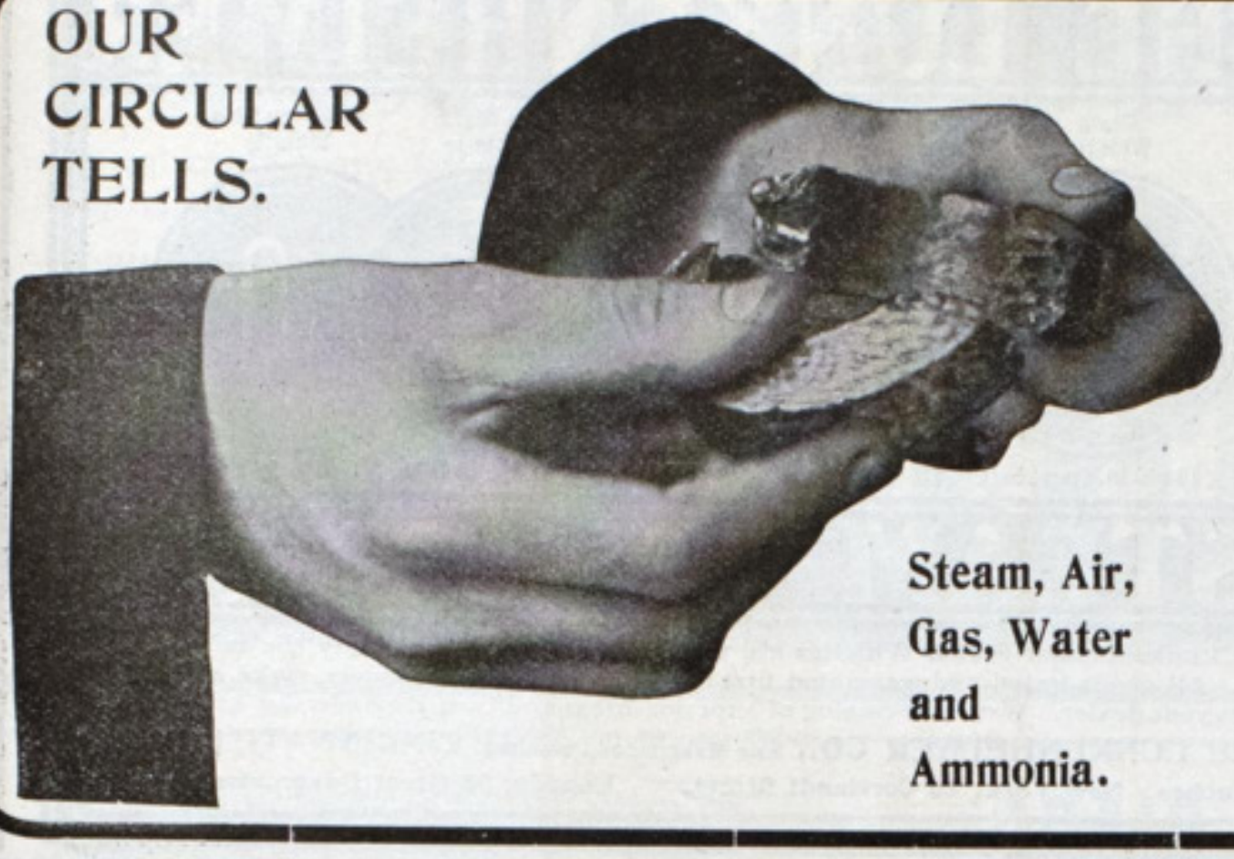

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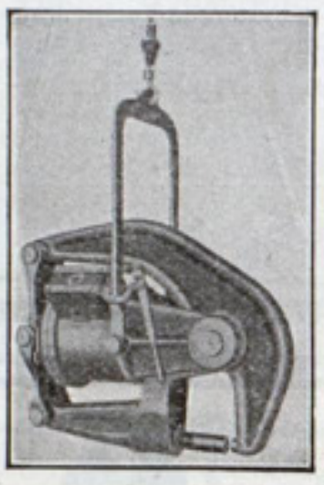

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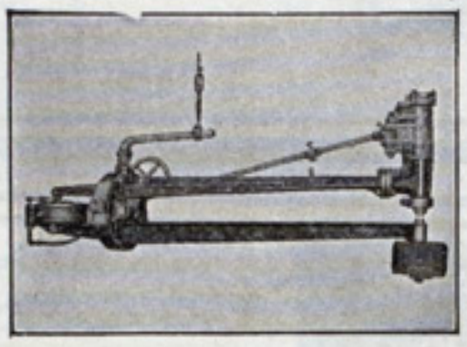

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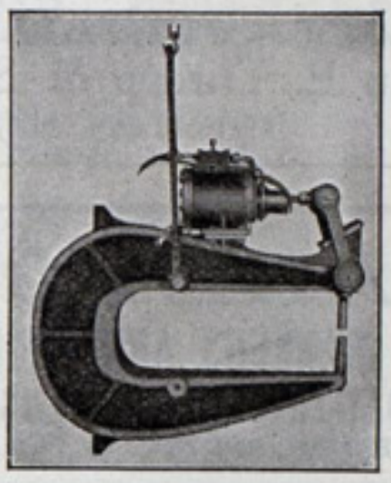

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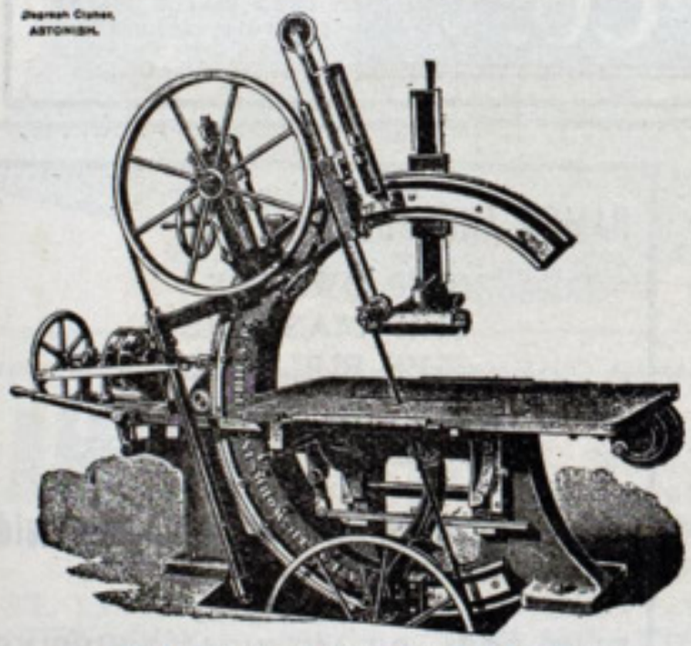

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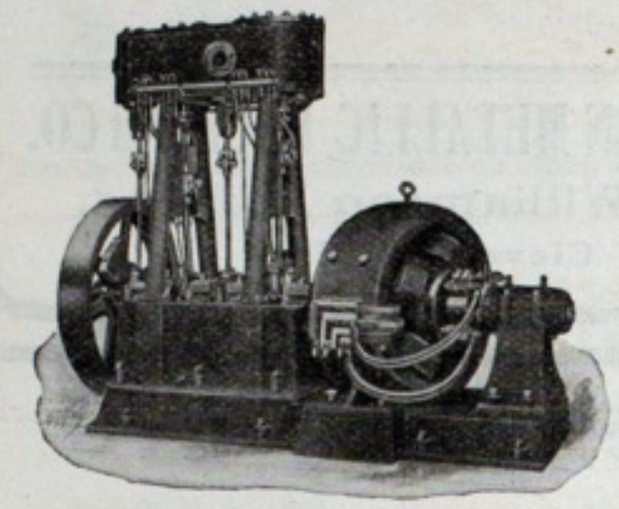

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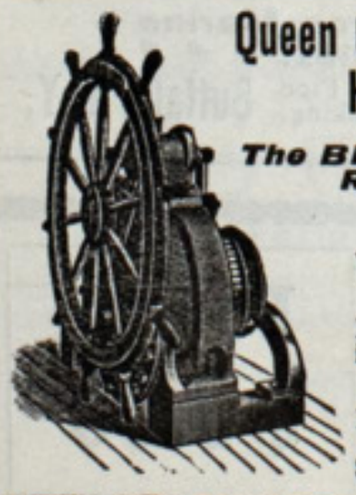

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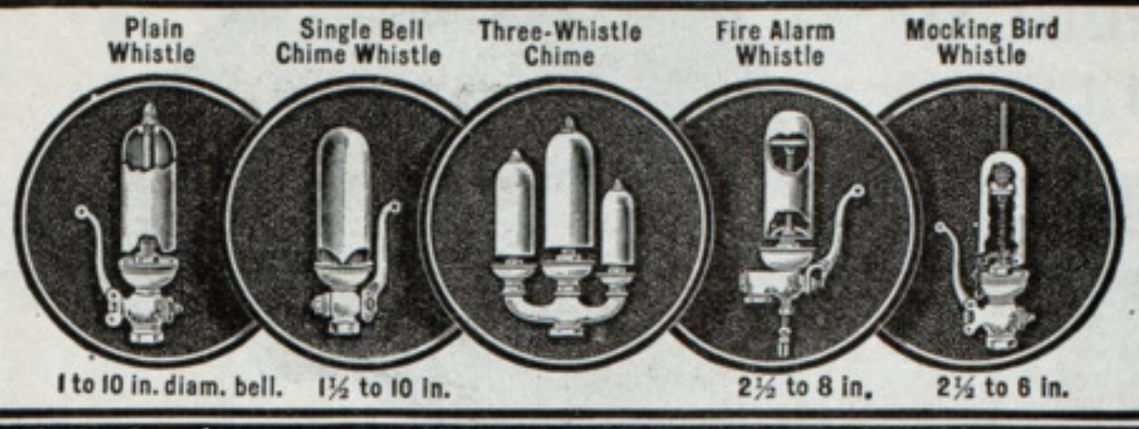

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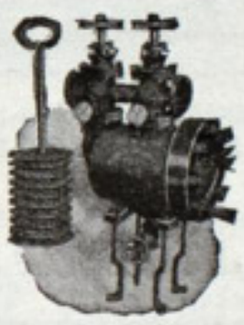

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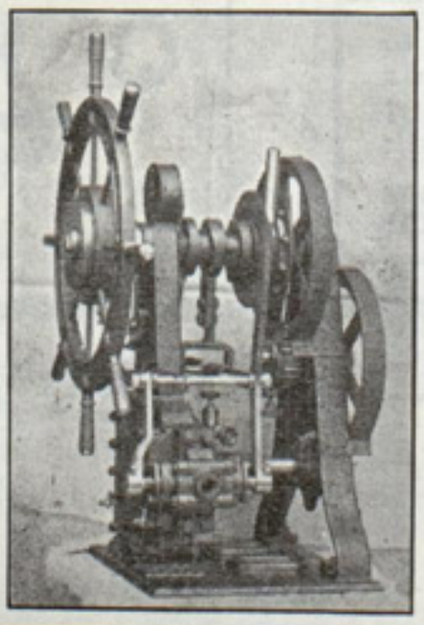

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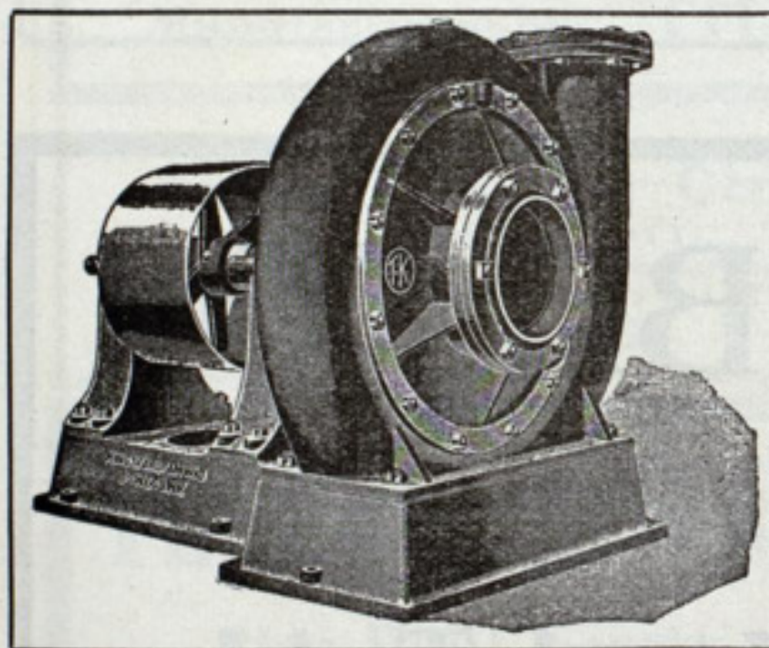

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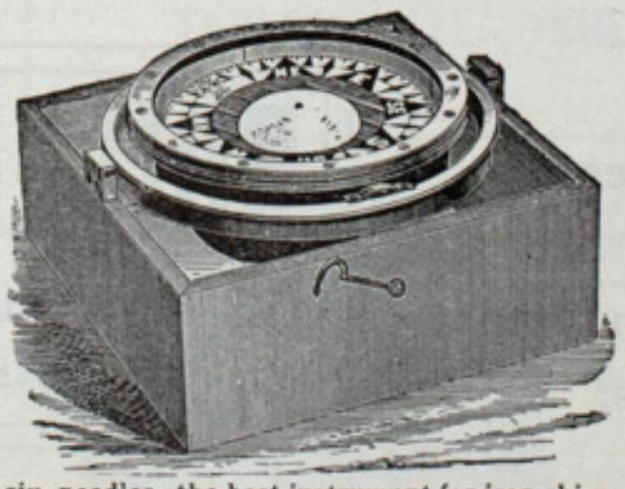

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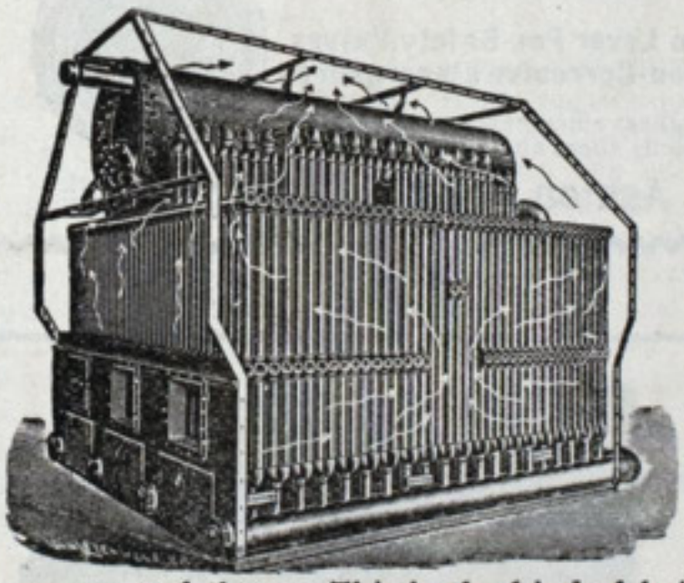

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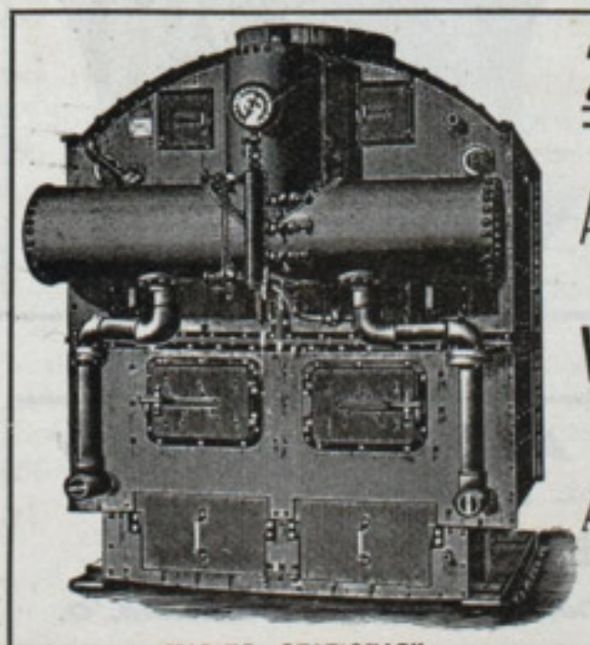

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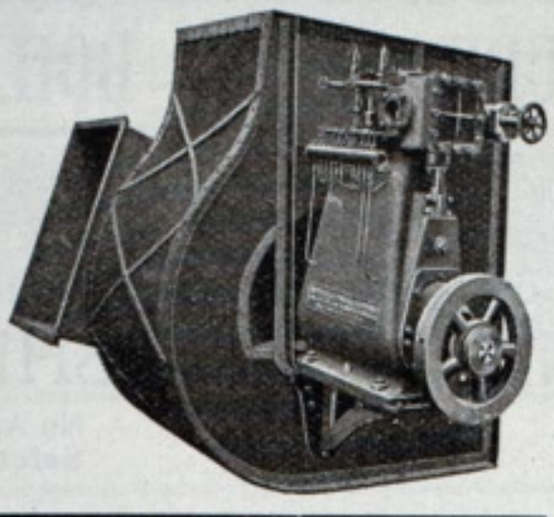

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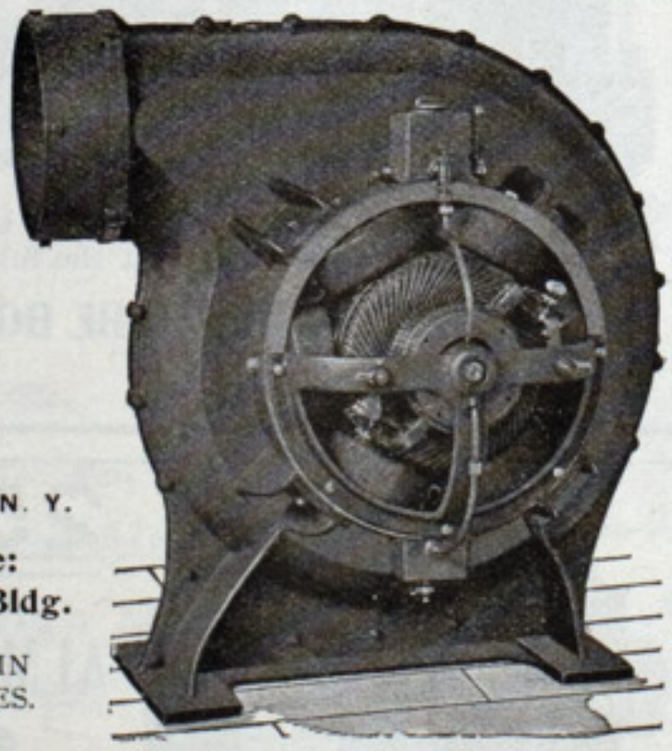

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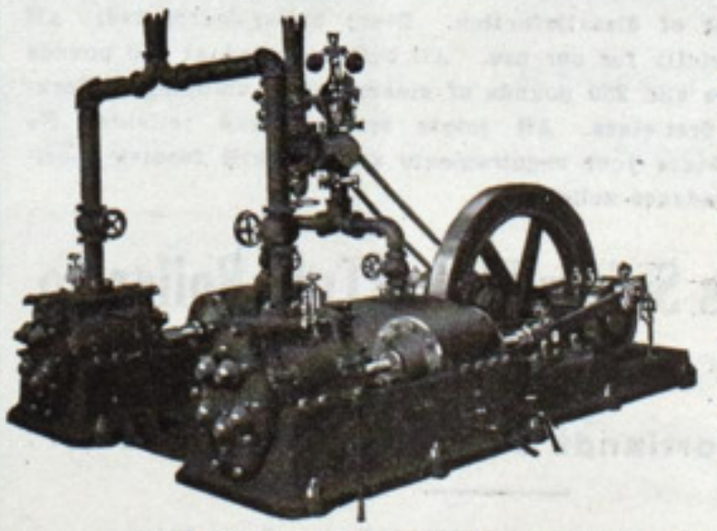

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